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# COMPREHENSIVE AREA-WIDE WATER and SEWER PLAN 1970

## STATE OF MONTANA-VOLUME 12

DEER LODGE & SILVER BOW COUNTIES

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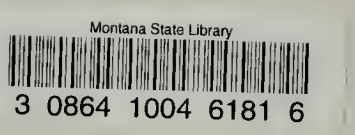

March 12, 1971

Department of Planning and Economic Development
State of Montana
Capitol Post Office
Helena, Montana 59601

Gentlemen:

In accordance with our agreement for water and sewer planning for forty nine of the fifty six counties in Montana, we hereby submit this Comprehensive Area-Wide Water and Sewer Plan.

This report is based on engineering and planning studies made throughout the county areas. The population characteristics and trends, the economics, and the natural resources of the counties were carefully analyzed. Based on information gathered from the study and on examination of existing water and sewer facilities, recommendations for new or improved water and sewer facilities were made where applicable.

We wish to express our appreciation for the cooperation we received from the federal and state agencies we have worked with and from the administrative agencies, from the community and civic leaders, and from the residents of the counties involved.

Respectfully submitted,

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# INTRODUCTION

The State of Montana is basically rural in nature with the vast majority of its people still living in small rural communities and there is every indication this situation will prevail for many years. It is important, therefore, to provide adequate and suitable water and sewer facilities for this rural population. It is just as important as for the larger urban areas, but this need of rural communities is often overlooked in our rapidly urbanizing society.

This Comprehensive Water and Sewer Study analyzes the present state of water supply and sewage disposal and is based on projected changes in population, economy, and land use. It projects improvements and additions required to meet needs during the next twenty years. Although the report is technical in nature, every effort has been taken to make it understandable to any interested person while retaining those details required for persons responsible for engineering these facilities. Adequate water and sewer facilities can be provided only with the active support of an informed and concerned citizenry.

While the general purpose of this study is to provide information necessary for coordinated planning of water and sewer facilities on a county wide basis, the specific aims of the study are to:

1. Develop an awareness on the part of the people of rural areas as to their water and sewer problems and needs.

2. Provide the information necessary for a concerned citizenry to be properly informed on water and sewer problems and needs.

3. Develop on the part of the people affected a desire to solve present or projected problems connected with water and waste disposal.

4. Suggest best and alternative sources of water and methods of waste disposal.

5. Prevent unnecessary duplication and underdesign or overdesign of water and sewer facilities.

6. Coordinate use of common facilities such as water supplies and waste treatment plants.

This plan encompasses all rural communities within the county containing five or more dwelling units but having a population of less than 5,500. The requirements of the Farmers Home Administration, which funded the project, and the Montana Department of Planning and Economic Development concerning water and sewer plans are satisfied by this study.

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MONTANA

DEER LODGE COUNTY

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## CONCLUSIONS, RECOMMENDATIONS, AND PRIORITIES

### Conclusions

The total population of Deer Lodge County is expected to increase steadily during the planning period. Most of the growth expected will occur in the city of Anaconda and in areas immediately adjacent to Anaconda. The State Hospitals at Warm Springs and Galen each are currently served by central water and sewer systems. The community of West Valley west of Anaconda is within the planning jurisdictional boundaries of the Anaconda City-County Planning Board, and a study of the water and sewer needs of this community is currently underway. The community of Opportunity and the recreational development in the Georgetown Lake area show a significant growth and increase of use, and the need for improved water and sewer facilities is evident. The community of Opportunity is of sufficient size to warrant construction of central facilities, and such facilities are proposed and discussed in this report. The major landowners of the Georgetown Lake area are working towards a comprehensive area plan for further development, and the tentative proposals of this plan are discussed in this report.

### Recommendations

This plan shows the various types of improvements which the communities should be considering during the planning period. Elaborate systems are not proposed but rather those facilities necessary to provide safe and adequate community systems. It is recommended that this general plan be adopted by the governing agencies of each community. A detailed approach, which must be undertaken to insure completion of the improvements in each community, cannot be covered in a report of this type. Community leaders, however, do have several courses of action which may be taken.

Most small communities do not have the means to plan and finance complete water and sewer systems. Therefore, to enable communities to acquire such facilities, five departments of the Federal Government have legislation authorizing loans or grants for construction of public works. These agencies are:

Farmers Home Administration
United States Department of Agriculture
P.O. Box 850
Bozeman, Montana 59715

Federal Water Quality Administration
United States Department of the Interior
% Montana State Department of Health
Helena, Montana 59601

Public Health Service
United States Department of Health, Education, and Welfare
Division of Indian Health
Billings, Montana 59101

Administration for Metropolitan Development
United States Department of Housing and Urban Development
Assistant Regional Administrator
Denver Regional Office
1050 South Broadway
Denver, Colorado 80209

Economic Development Administration
United States Department of Commerce
Montana Field Coordinator
207 Medical Arts Building
Butte, Montana 59701

The legislation is constantly changing; therefore, community leaders should investigate the various alternatives and determine which program and course of action would be most beneficial to them.

## Priorities

That a particular system requires immediate improvements and another system will be satisfactory for a definite period are difficult to establish. Several indicators for establishing priorities are available, however. The general health of the people is the prime consideration, and this can only be insured when safe water supplies are provided. Water supply in adequate quantities is another important factor. Waste water must be treated and disposed of by safe methods to minimize the problems of pollution and to protect public health. The total number of persons benefited by any improvement must also be considered. These basic criteria were used in establishing the following priority listing:

1. Opportunity Sewer System. The reported problems of high ground-water table affecting sewage disposal and the evidence of shallow well contamination are of prime concern in this area. Existing problems and the number of persons who would benefit from the improvements make the construction of this facility necessary and feasible.

2. Georgetown Lake Area Sewer System. Evidence of lake water contamination and the projected increase in the recreational development of this area cause these projects to be of top priority. Both central and individual systems will be necessary to solve current problems.

3. Opportunity Water System. Problems that have been encountered concerning the contamination of shallow water wells make the necessity of a central water system apparent. Present population figures and potential health hazards are reasons to warrant planning and construction of this project.

4. Georgetown Lake Area Water Systems. Adequate water supplies have been available through individual wells; however, increased development of recreational facilities may result in the need for central systems. To avoid future contamination of water supplies, planning for both individual and central systems should begin at this time.

This list of priorities is not intended to govern the order in which action should be taken. The order merely ranks the severity of the problems and the need for improvements.

## THE LAND

### General Characteristics

Deer Lodge County is located in the southwestern portion of the State of Montana and shares a common border with the counties of Beaverhead, Silver Bow, Jefferson, Powell, and Granite. Compared to other Montana counties, Deer Lodge County is quite small and has a total area of only 741 square miles of which only three square miles represent water surface area. The Clark Fork and Big Hole Rivers and numerous small lakes and streams account for the water surface area.

The county has a topography characterized by high rugged mountain ridges and narrow valleys. Elevations vary from about 5,288 feet above sea level at the town of Anaconda to mountain peaks on the Continental Divide reaching 10,793 feet. Population and development have generally been confined to the mining town of Anaconda, the largest town and county seat, located in the central portion of the county.

Deer Lodge County has a good transportation system. U. S. Highway 10 which enters the eastern county area as Interstate 90 leads northward

to Deer Lodge. U. S. Highway 10A branches west from U. S. 10 and, passing through Anaconda and the Georgetown Lake area, leads to Philipsburg in the northwest. State Highway 48 bridges the fork made by U. A. 10A branching off from the main route. Dirt and gravel roads serve the more outlying rural areas.

The county area is served by a more than average number of rail lines. The Butte, Anaconda, and Pacific Railroad was originally built for and by the Anaconda Copper Company to transport ore from its Butte mines to the smelter at Anaconda and only extends between the two towns. At present the railroad also provides general freight service to the area. The southern main line of the Burlington-Northern Railroad follows the route of the Clark Fork across the northeastern part of the county. Two passenger trains of the Burlington-Northern, the North Coast Limited and the Mainstreeter, travel the route twice daily along with numerous freight trains in varying numbers. The Chicago, Milwaukee, St. Paul, and Pacific Railroad also travels the river route across the county and provides general freight service to the area.

Although there are no commercial airports in the county, Anaconda does have a privately owned, paved airstrip which has been expanded to 4,500 feet. The facility is available for public use and provides minimum aircraft services. Daily air service and connections to nation wide airlines are available at the Butte airport located twenty five miles to the south.

Deer Lodge County lies within the Butte Division of the Montana Power Company and most of the power service in the county is distributed by this company. Although some of the source of power is Montana Power facilities, most of the power comes from Bonneville Power Administration sources. Anaconda is the location of five major switching or substations: the Montana Power Company has three and the Bonneville Power Administration and the Chicago, Milwaukee, St. Paul, and Pacific Railroad each have one. This latter company only supplies power for its electrically powered railroad.

Since major power producing centers and relay stations are usually located at widely separated points and provide service to large areas, Map 2 shows the major power grid system for the entire State of Montana. Major gas transmission lines are also shown.

Mountain States Telephone supplies the entire county area with telephone service.

## Land Ownership and Use

Land ownership for Deer Lodge County is shown on Chart 1. As indicated, private lands account for sixty six percent, 489 square miles of area. Small amounts of municipal and county owned lands are included in this category. The federal government owns thirty two percent, 240 square miles of the land, while the State of Montana owns two percent, a total of twelve square miles.

Forested regions account for fifty four percent of the land use in Deer Lodge County, 401 square miles. Almost all of this is made up by the Bitterroot, Deer Lodge, and Beaverhead National Forests. Forty four percent, or 319 square miles of the county, is used for agricultural purposes. The remaining two percent of the county is used for such miscellaneous purposes as town sites and transportation routes. The three square miles of water surface area are included in this category. The land use distribution can be seen on Chart 2.

## Natural Resources

The development of the mineral industry in Deer Lodge County is largely dependent on the Anaconda Copper Company. The company influences the economy, social structure, and population of the area and produces most of the country's copper. Anaconda was founded in 1883 because of its ideal location for a smelter, abundant water supply, and good timber resources. Since that time the Anaconda Company has been mining copper from both open pit and hard rock mines.

Besides extracting copper, the Anaconda Company also produces quicklime to be used for metallurgical purposes and water treatment at its own plant.

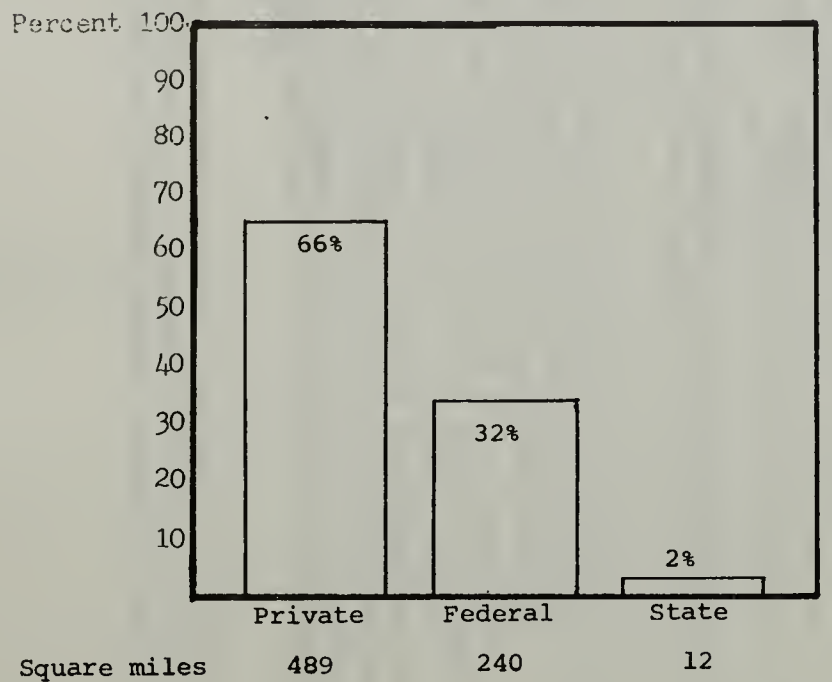
Other minerals produced in the county are zinc and manganese, byproducts of copper mining operations. The demand for manganese concentrates has, however, been decreasing in the past few years. Thorium, a mineral that in its final processed stage is used as a fuel in nuclear reactors, is also found in the county.

Gold, silver, and lead mines are also in operation. A list of the more prominent ones includes the Champion Silver Mine, and the Minnehaha, Horseshoe, and Helena Mines. Tungsten is mined at the Old Bonanza Mine, and recent developments have enlarged the production of the mineral.

Non metal production in the area includes sandstone, quartz, and quartzite. These are used as industrial silica which in turn is used in the manufacture of cement, roofing material, and metallurgical

CHART 1

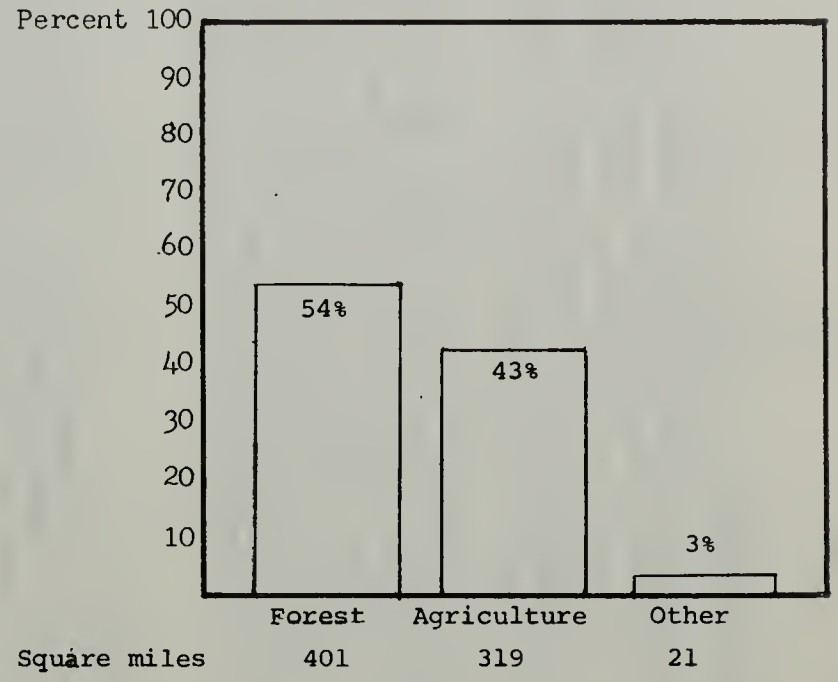
Land Ownership
Deer Lodge County




| Square miles | 489 | 240 | 12 |
|---|---|---|---|

CHART 2

Land Use
Deer Lodge County




| Square miles | 401 | 319 | 21 |
|---|---|---|---|

Sources: 1. The Montana Almanac, 1959-60
2. Forest Service, U. S. Department of Agriculture

purposes. Small deposits of clay are dug from the Placer Fire Clay Mine. Its main use is in fire clay.

In spite of the apparent abundance of timber in the county, only minor logging is being done. Marketable stands of timber are often widely scattered or in largely inaccessible areas and tend to limit logging operations. Douglas fir, western larch, Engelmann spruce, Ponderosa pine, and lodge pole pine are the economically important species of trees.

Recreational opportunities are in abundance and are widely used. Hunting in the mountains and valleys provides opportunities for prize game and beautiful scenery. The varieties of big game include elk, moose, bear, deer, and mountain goat and sheep. The bird hunter has his choice of ducks, geese, pheasants, and grouse. Fishing in both streams and lakes provides the angler with opportunities for rainbow, brook, and cutthroat trout. Georgetown Lake lies in the northwest corner of the county and provides the full complement of water related sports. Part of the Anaconda-Pintlar Wilderness area is located within the county. It is maintained by the United States Forest Service in its natural, undeveloped state and provides unspoiled, primitive wilderness for the hiker and pack horse enthusiast.

In the future the recreational field in the county will expand and play an even more important role in the economy of the area.

## Soils

The soils of Deer Lodge County are generally those of grassland and forested types with the majority supporting forest products. In the higher elevations poor quality alpine type soils occur. Agricultural uses tend to generally be limited to rangelands and some haylands.

Soils are covered in more detail later in this report.

## Water

As indicated earlier, less than one percent of the surface area of the county is water. The main drainage feature is the Clark Fork which flows across the eastern end of the county and drains the area generally southeastward. Warm Springs Creek drains the northern county area eastward into the Clark Fork, and the Big Hole River, which forms part of the southern boundary, drains that portion of the county generally eastward.

Water resources, both surface and ground, are covered in more detail

later in this report.

## THE PEOPLE

### Population

For analytical and projective purposes, it is necessary to study the population history of Deer Lodge County to find out what has happened and what is going to happen. Chart 3 graphically shows the growth of the county as compared with that for Montana and indicates the future growth for both.

The number of persons living in the county has fluctuated considerably throughout the past fifty years. The 1970 figure is only 177 more than that recorded in 1920 in spite of some impressive gains in the past. Nineteen sixty was the highest year and recorded an increase of 3,317 persons over the 1920 number. Moderate to slow growth is expected throughout the twenty year planning period.

The county was classified as an urban area in 1960 in that it contained one urban center, Anaconda. Table 1 indicates that between 1950 and 1960 the rural areas grew at a faster rate than did the urban areas. The population gain occurred within the rural non farm areas and decreases were noted on the farms. The rural population grew at a rate three times that of the urban areas. From 1960 to 1970 a two to one population decline occurred in the urban areas over that in the rural category. The percentages of each population group have not varied significantly over the past twenty years. Almost two thirds of all persons reside in urban areas. Of the remainder, the bulk live in rural non farm areas while only one percent reside on farms.

The 1960 population was 2,087 persons higher than that recorded in 1950. The gain in numbers resulted from a net migration loss of 630 persons and an excess of 2,717 births over deaths. The 1950 to 1960 change in sex composition for Deer Lodge County is shown in Chart 5. Males continued to dominate the population even though the 1960 preponderance almost centralized. The male percentage of fifty three percent in 1950 narrowed to fifty one percent in 1960. The ratio is expected to remain stable throughout the twenty year planning period.

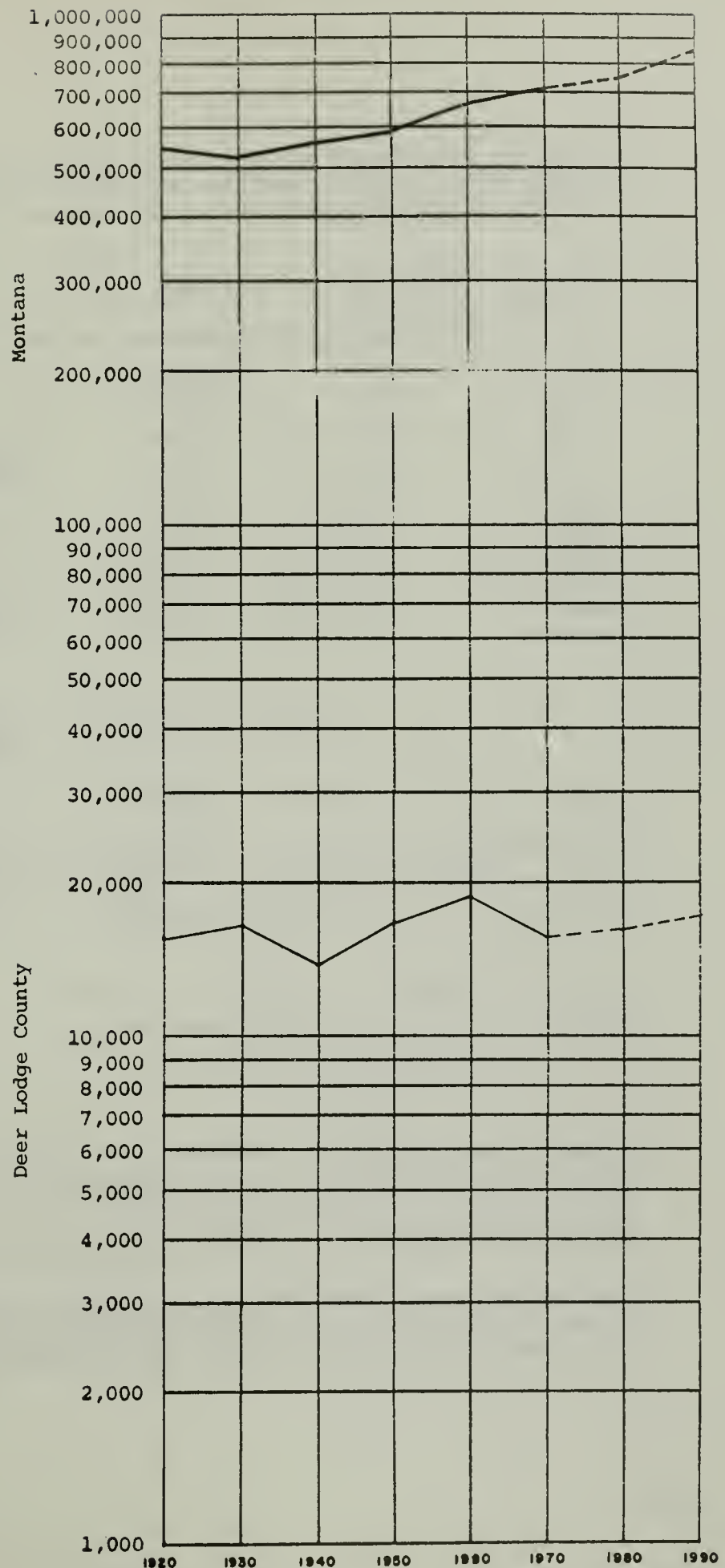
The age distribution by sex for 1950 and 1960 are shown in Table 2. Understandably, the majority of growth occurred within the younger age groups.

The community of Opportunity is the only urban area included within this study. Many of the small developed communities in the county are

CHART 3

COMPARATIVE POPULATION TRENDS

Deer Lodge County and Montana




Sources:

1. U.S. Census of Population
2. Intermountain Planners, Inc.

within the Anaconda urban area and, therefore, have not been included in this study. Other communities also were not included because of the lack of sufficient development and population.

TABLE 1

Urban-Rural Population Changes for Deer Lodge County

1950-1970

| | 1950 | 1960 | Changes Number | 1950-1960 Percent |
|---|---|---|---|---|
| Total | 16,553 | 18,640 | +2,087 | +12.6 |
| Urban (Inc. Towns) | 11,254 | 12,054 | + 800 | + 7.1 |
| Rural | 5,299 | 6,586 | +1,287 | +24.3 |
| Farm | 531 | 273 | - 258 | -48.6 |
| Non Farm | 4,768 | 6,313 | +1,545 | +32.4 |

| | 1960 | 1970 | Changes Number | 1960-1970 Percent |
|---|---|---|---|---|
| Total | 18,640 | 15,500 | -3,140 | -16.8 |
| Urban (Inc. Towns) | 12,054 | 10,000 | -2,054 | -17.0 |
| Rural | 6,586 | 5,500 | -1,086 | -16.5 |
| Farm | 273 | 150 | - 123 | -45.1 |
| Non Farm | 6,313 | 5,350 | - 963 | -15.3 |

Sources: 1. U. S. Census of Population

2. Intermountain Planners, Inc.

Because of the time that has elapsed since the 1960 Census, current population estimates had to be derived from several sources in the field. Surveys and interviews were conducted to determine what now exists and what is expected in the future. Table 3 indicates the past population for Opportunity and its forecasts up to 1990.

The town and fringe areas of Anaconda were not covered in the report because of the number of persons residing there. The scope of this study excludes those urban areas having less than five housing units

TABLE 2

Age & Sex Composition of Deer Lodge County

| Age Group | 1950 Male | 1950 Female | 1960 Male | 1960 Female |
|---|---|---|---|---|
| Under 5 | 826 | 868 | 1,100 | 1,022 |
| 5-14 | 1,251 | 1,212 | 1,876 | 1,773 |
| 15-19 | 431 | 447 | 612 | 676 |
| 20-24 | 525 | 545 | 404 | 432 |
| 25-34 | 1,223 | 1,182 | 960 | 965 |
| 35-44 | 1,356 | 1,147 | 1,252 | 1,229 |
| 45-54 | 1,157 | 850 | 1,392 | 1,167 |
| 55-64 | 956 | 792 | 1,030 | 774 |
| 65-74 | 707 | 549 | 613 | 595 |
| 75 + | 272 | 257 | 338 | 330 |
| Total | 8,704 | 7,849 | 9,577 | 9,063 |

Source: U. S. Census of Population, 1950-1960

TABLE 3

Population Forecast for the Town of Opportunity

Deer Lodge County

| 1950 | 1960 | 1970 | 1975 | 1980 | 1990 |
|---|---|---|---|---|---|
| 500 | 650 | 830 | 875 | 900 | 900 |

Sources: 1. U. S. Census of Population, 1950-1960

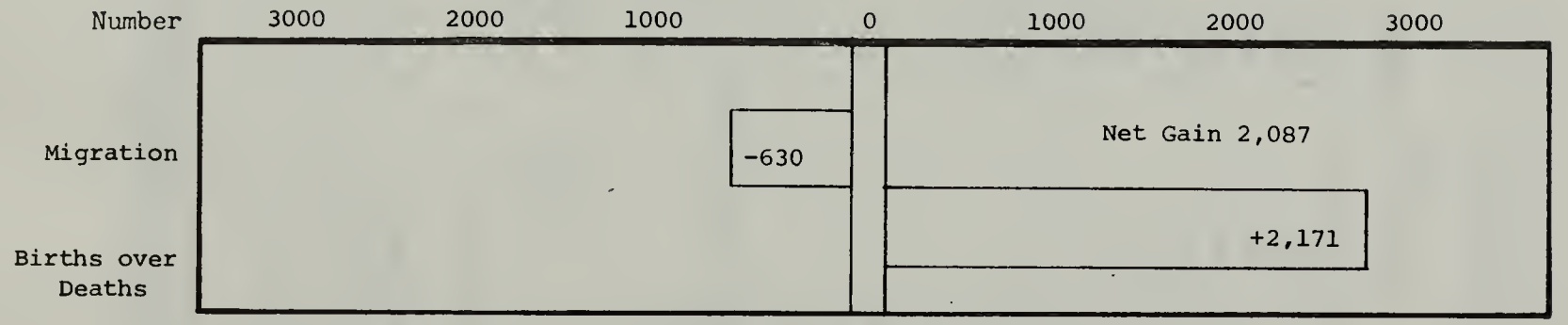
2. Intermountain Planners, Inc.

and more than 5,500 population.

The number of persons in Opportunity will increase by about seventy persons over the next twenty years. The forecasted eight percent

CHART 4

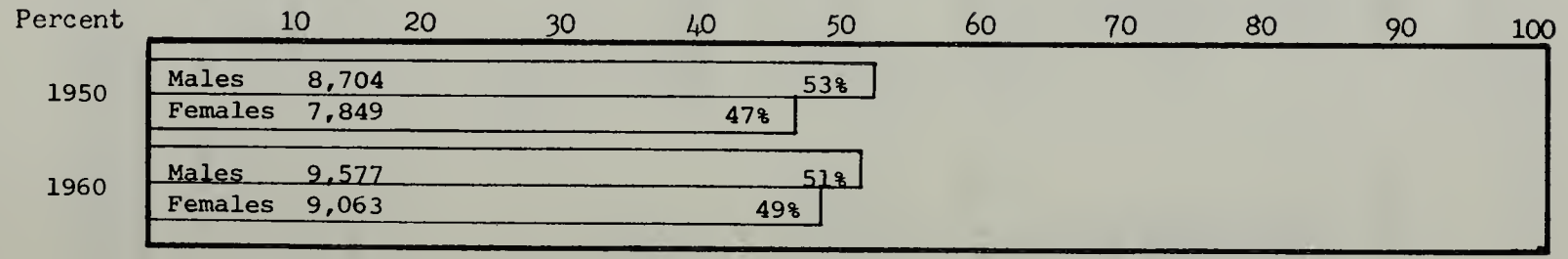
Population Change
Deer Lodge County 1950 - 1960




Source: Net Migration of Population, 1950-1960 by Age, Sex, and Color, U. S. Department of Agriculture

CHART 5

Population by Sex
Deer Lodge County 1950 - 1960




Source: U. S. Census of Population, 1950-1960

growth will necessitate an additional twenty housing units by 1990. The new housing development is expected to occur within the boundaries of the existing community.

Population and development surrounding the Georgetown Lake area were studied for this report. Collected field data indicates that very few persons reside year round in the area, and the bulk of the people live there during the summer months only. The scope of this study is limited to communities having more than five dwelling units but having a population less than 5,500 persons. For this reason, the information for Deer Lodge County does not speculate on the influx of summer persons into the area. A special study needs to be done in order to determine the full impact of summer visitors and residents around the lake.

The population figures reflect only those factors and trends for which information is available. New technological advances, new industries, or other unforeseen events may alter these projections. If such an event occurs, the areas affected should be studied in light of the new information.

## Housing

In 1960 there were 5,768 housing units within Deer Lodge County. Chart 6 indicates that three fourths of the homes were in urban areas, while almost one fourth were of the rural non farm type. The remainder were represented by farms. The urban homes were all located in the City of Anaconda which, because of size, has not been included within the scope of this study. In order to analyze housing, all dwellings in the county have been considered. The median housing unit size was 4.10 rooms per unit, and the median household size per occupied unit was 3.29 persons. Of those units, more than half were owner occupied while one third were used for rental purposes. Chart 7 indicates that one home in eight was vacant. The condition of housing in 1960 is reflected in Chart 8 which indicates that six percent were in need of replacement while one home in seven needed repair. The remainder were classified as sound.

Chart 9 reflects the 1960 status of housing units in terms of source of water, water supply, and method of sewage disposal. For geographical reference, the data shows the status for Deer Lodge County as a whole and for the urban, rural non farm, and farm homes.

Three fourths of all homes in the county were served by a public water system or by a private company. Those served included almost all of the urban homes and very few of the remaining dwellings. The urban homes are those in the City of Anaconda. Generally, the remaining

homes used individual wells as the main source of water supply. Only three percent of the homes used some other source than those listed.

Ninety seven percent of the homes had piped water in 1960. Only two percent did not.

Seventy five percent of all homes used a public sewer system for waste disposal. The rural non farm and the farm homes mainly relied on either septic tanks or cesspools for disposal while one home in seven used some other method.

The housing data indicates that generally the rural non farm homes, or 1,385 dwellings, lacked public water and sewer systems. Attention should be given to upgrading those deficiencies.

HOUSING
Deer Lodge County 1960

Chart 6
Housing Classification

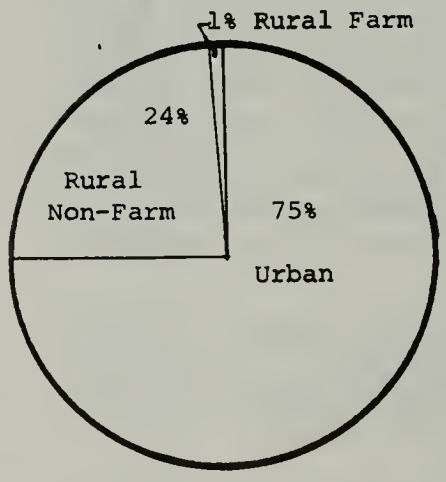



Chart 7
Housing Tenure

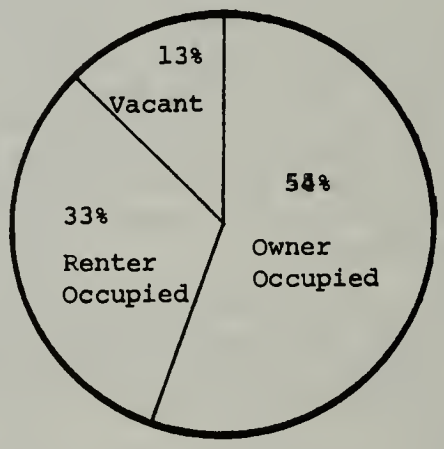
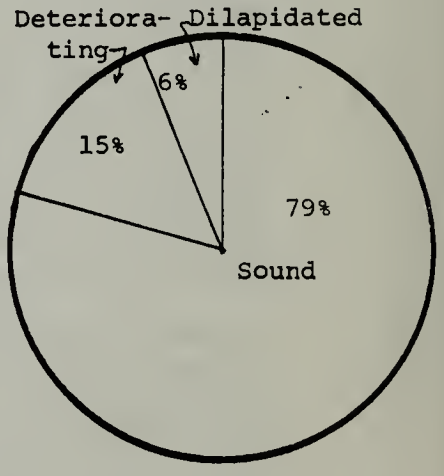


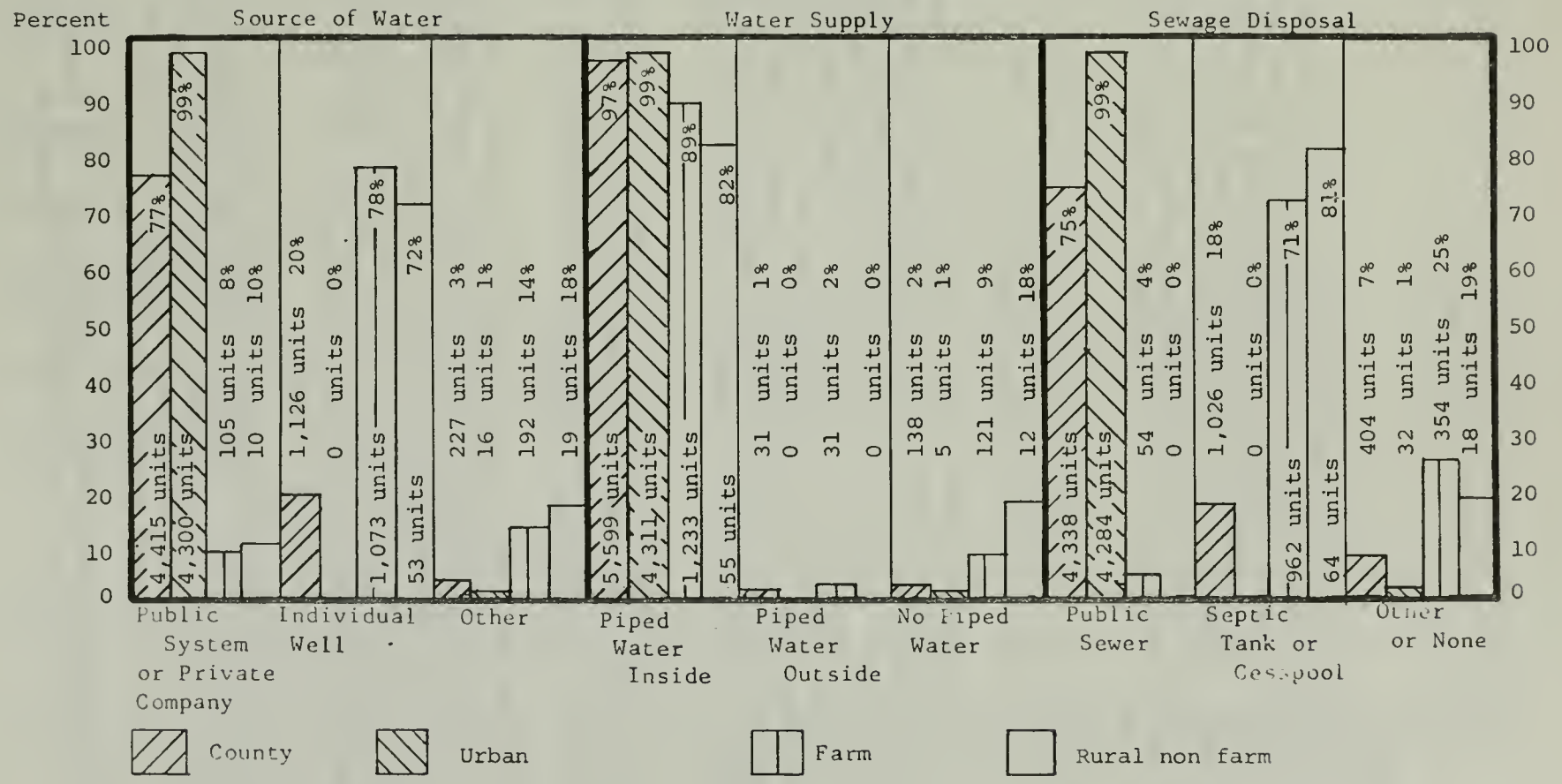

Chart 8
Housing Condition




Source: U. S. Census of Housing, 1960

CHART 9

Sewer and Water
Deer Lodge County 1960




Source: U. S. Census of Housing, 1960

## THE ECONOMY

### Labor

People have a direct relationship on the economy of an area because of their role as both producers and consumers of goods and services. The following economic analysis of Deer Lodge County is concerned primarily with the total economic spectrum and how it may affect the future of the area. Changing economic conditions can have either a good or a bad effect on an area in terms of population growth, ability to provide for public improvements, or in determining the general overall living environment.

Employment rose three percent in the county between 1950 and 1960 while the population increased by thirteen percent. The rise is contrasted to a six percent gain in the Montana labor force.

The past employment change by major industry groups is shown in Chart 10. The gain in employment was considerably smaller than that for the period between 1940 and 1950, and all increases were confined to female oriented type jobs. As a result, the number of women substantially increased in the labor market. The over expansion of the female labor force pushed the unemployment rate to an acute level. During the period, combined employment in mining and manufacturing operations declined more than a tenth, accounting for most of the job closings. The major gains in employment occurred in the services and finance group.

The largest portion of the labor force worked in the manufacturing industry group, more specifically for the Anaconda Smelter. Of the total amount in this group, ninety percent were engaged in the production of primary metal products.

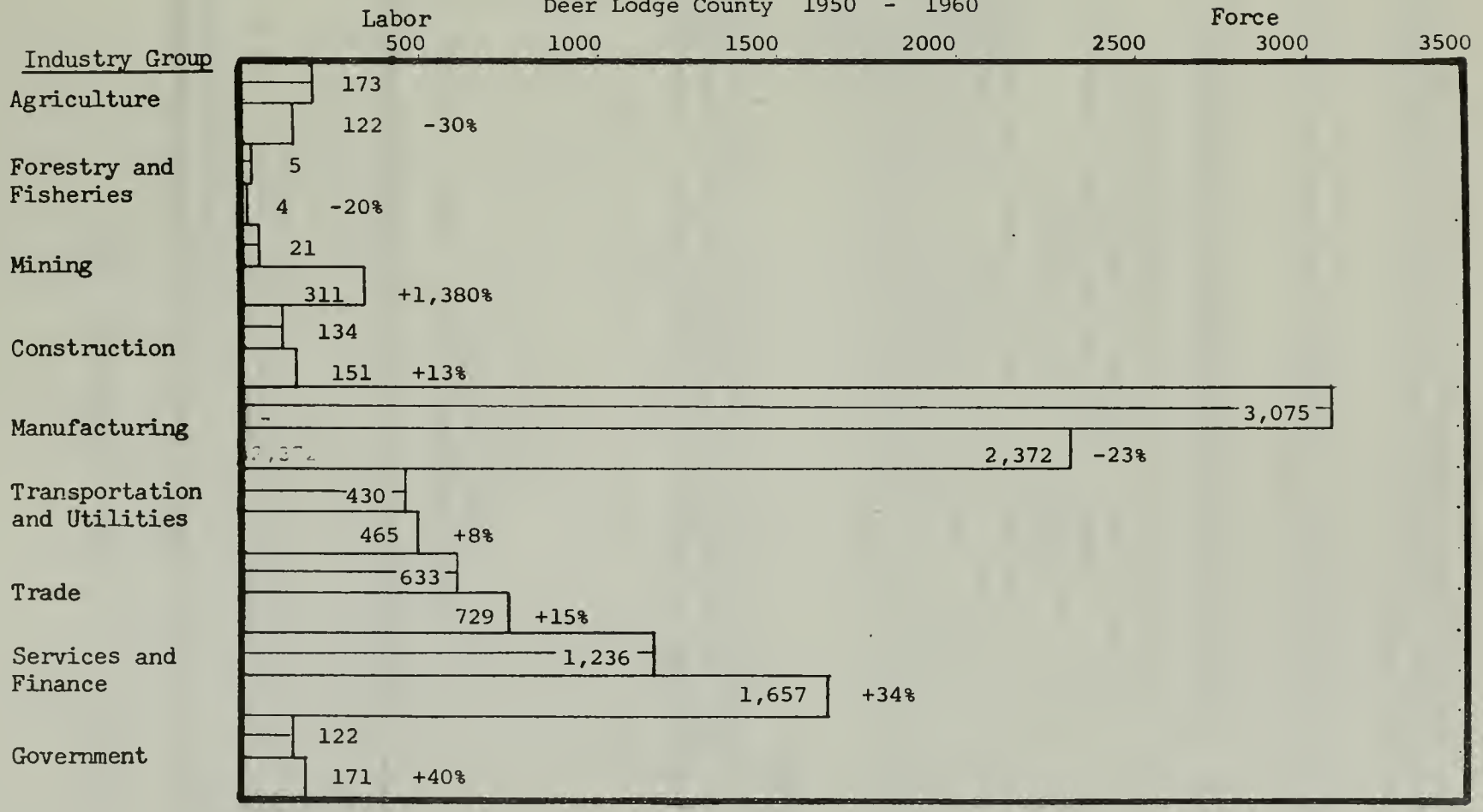
The services and finance group represented the second largest segment of the labor force in 1960. An analysis of the characteristics of this group indicates the degree to which Butte influences the county. Over one third of the people in this group worked in St. Ann's Hospital while another fifteen percent were represented by the professional services industry, which includes doctors. Another fifteen percent were engaged in the education profession while one worker in nine worked within private households.

The increase in the trade industry is another indication that Butte influences the shopping. Marketing studies indicate that complete shopping facilities are available in Anaconda; however, the county lies within the retail and wholesale market which is centered in Butte just twenty seven miles away on Interstate 90.

The percentages for employment by industry group, as shown in Table 4, provide an insight into local employment characteristics. The table

CHART 10

Employment Change by Major Industry Group
Deer Lodge County 1950 - 1960




*Includes Some Industries Not Reported

Source: U. S. Census of Population, 1950-1960

shows the relative weight of each industry group in the county and offers a comparison with that existing in 1960 for the State of Montana and the United States.

The manufacturing industry had an employment rate within the total labor force four times greater than that for the state and one and one half times that for the nation.

The services and finance group had an employment level slightly higher than that for Montana and almost twice that for the United States.

The 1969 labor statistics provided by the Employment Security Commission of Montana indicate a decrease in employment over that reported for 1960. The county in 1962 was designated an area of substantial and persistent unemployment by the commission.

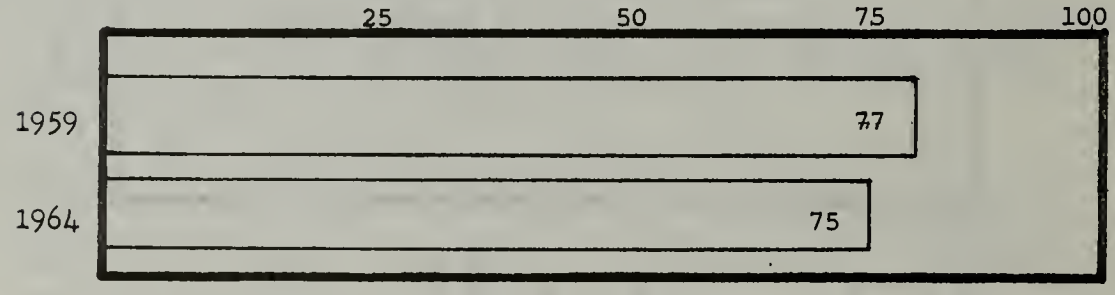
Manufacturing at the smelter will continue to serve as the economic base in Deer Lodge County. Supporting industries, such as services and finance, will grow or decline in proportion to the major activities of The Anaconda Company. Employment growth will be directly affected by automation, the trend in mining output of the Silver Bow Mine, and the degree to which copper operations become centralized in Butte.

## Agriculture

A farm is defined by the United States Census as a place having at least ten acres of land devoted to agriculture and selling at least fifty dollars worth of agricultural products annually. According to

CHART 11

Number of Farms
Deer Lodge County 1959 - 1964




Source: U. S. Census of Agriculture, 1964

Chart 11, there were seventy five farms in Deer Lodge County in the above category in 1964, almost three percent fewer than there were in 1959.

TABLE 4

Percent of Total Employment by Industry Groups

Deer Lodge County, Montana and United States

1960

| | Deer Lodge County | Montana | United States |
|---|---|---|---|
| Agriculture | 2 | 17 | 11 |
| Forestry and Fisheries | 1 | 1 | 1 |
| Mining | 5 | 3 | 1 |
| Construction | 2 | 7 | 5 |
| Manufacturing | 40 | 10 | 27 |
| Transportation and Utilities | 7 | 9 | 7 |
| Trade | 12 | 21 | 19 |
| Service and Finance | 28 | 26 | 16 |
| Government | 3 | 6 | 13 |
| Total | 100 | 100 | 100 |

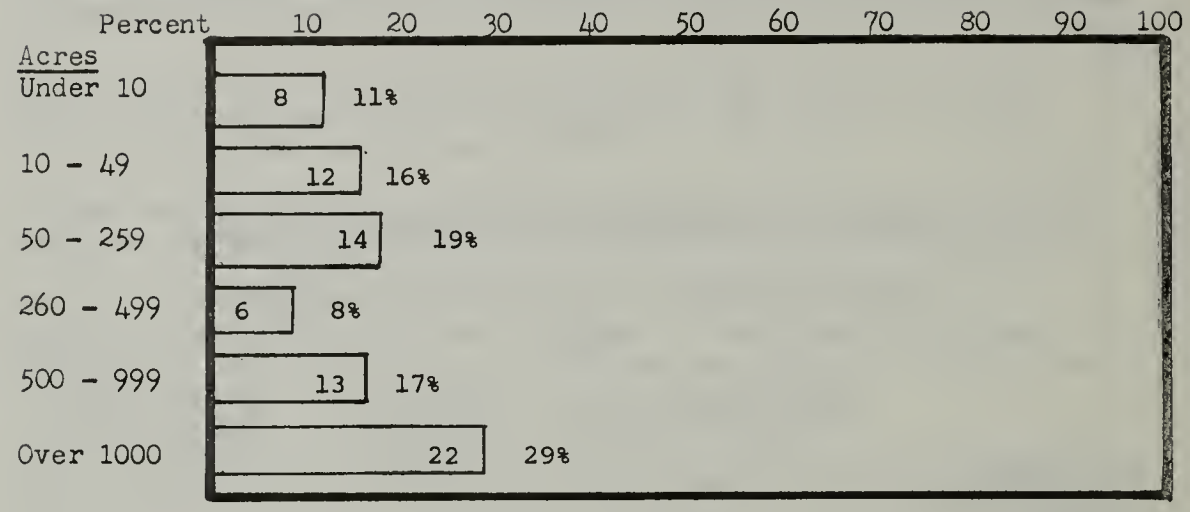
Source: U. S. Census of Population, 1960

The 1964 classification of farms by type was as follows:

| | | |
|---|---|---|
| Field crop farms other than vegetables, nuts, and fruit | | 6 |
| Other field crops | 6 | |
| Poultry farms | | 1 |
| Livestock farms other than poultry and dairy | | 28 |

CHART 12

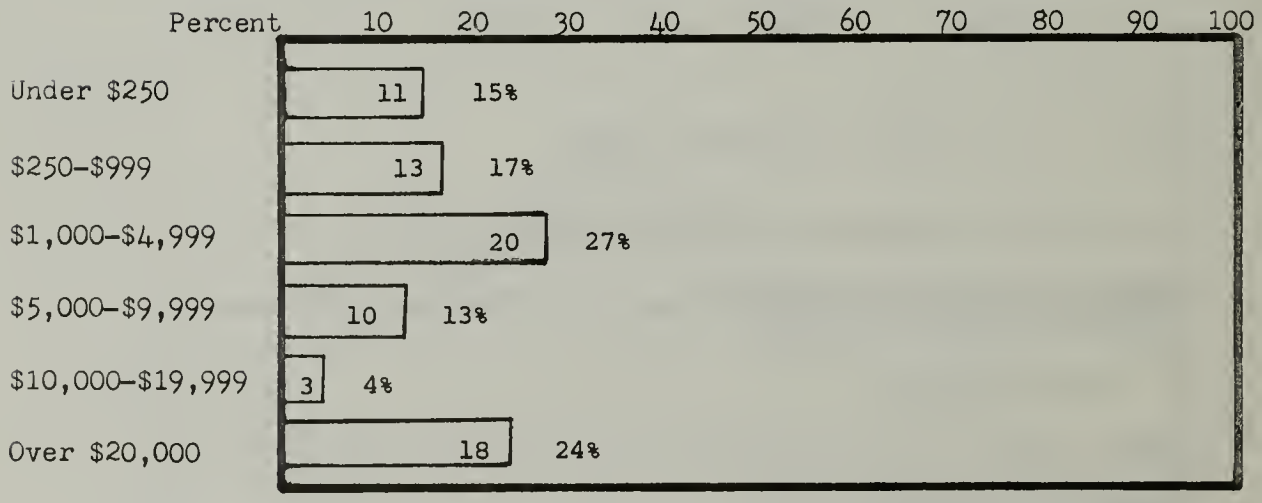
Farms by Size
Deer Lodge County 1964




Source: U. S. Census of Agriculture, 1964

CHART 13

Number of Farms by Value of Farm Products Sold
Deer Lodge County 1964




Source: U. S. Census of Agriculture, 1964

| | |
|---|---|
| General farms | 4 |
| Miscellaneous and unclassified | 36 |
| Total | 75 |

Of the total number of farms, twenty seven were classified as part time and six were classified as being operated by semi retired persons.

The average size farm in 1964 was 2,724 acres; however, fifty four percent were under five hundred acres, thus suggesting that some quite large size farms existed. Thirty seven percent were livestock producers and only one farm in twelve raised crops. Chart 12 indicates that less than one third of the farms were over one thousand acres in size while over half were under five hundred acres.

The value of products sold by the number of farms is shown in Chart 13. As indicated, only about one fourth of all farms had gross sales of over $10,000 for products sold, and twenty four percent received in excess of $20,000. At the same time, almost sixty percent of the farms reported sales under $5,000. The sales data indicates a number of farms with below average income and a small minority accounting for more of the sales.

The cash receipts data for the county from 1964 to 1967 is as follows:

| Year | Livestock | Crops | Total |
|---|---|---|---|
| 1964 | $578,200 | $482,200 | $1,060,400 |
| 1965 | $724,300 | $857,100 | $1,581,400 |
| 1966 | $960,600 | $566,500 | $1,527,100 |
| 1967 | $877,000 | $513,800 | $1,390,800 |

As shown by the amount of sales, Deer Lodge County cannot be classed as being agricultural in nature. Throughout the four year reporting period only two counties in the state had less agricultural sales than Deer Lodge County. The sale of livestock products had a slight preponderance over crop products.

The nature of agriculture will not change significantly throughout the twenty year planning period. As a result of consolidation, fewer but larger farms will occur. The rank of agriculture in the total economy will remain minor.

## THE GOVERNMENT

Before any meaningful consideration can be given to major capital improvement projects, it is necessary to study the governmental organizations in Deer Lodge County and to analyze their economic structure. At present there is only the county government involved within the scope of this water and sewer study; the City of Anaconda and its environs has been excluded due to the size of the population. A Board of County Commissioners presided over by a chairman governs the county.

In financing capital improvement projects, the incorporated municipalities have power to bond and raise the necessary monies for funding projects. The unincorporated small towns do not have similar power and, therefore, must rely on revenues of the county government.

In fiscal year 1969 the county revenue and expenditure figures were $4,281,774.94 and $4,173,522.41 respectively. The assessed valuation of county property was $53,790,280.00.

There are several methods presently available to communities for financing water and sewer systems. Incorporated cities and towns may use municipal bonds, municipal revenue bonds, and Special Improvement District bonds. Unincorporated towns, on the other hand, may use Rural Special Improvement District bonds and County Water and Sewer District bonds. Incorporated cities and towns and adjacent unincorporated areas may also use Metropolitan Sewer District bonds.

## THE WATER RESOURCES

### General

The water resources of any area are one of its most important assets. Montana is fortunate in that water is in abundant supply over much of the state. This is especially true in the mountain areas and along the major drainages. Water is essential for many human needs with individual consumption and sanitation being foremost. Industrial and agricultural uses of water are perhaps next most important. The recreational use of water has also become a significant factor in modern day living.

In his use of this resource, man in the past has polluted much of the available fresh water and degraded it to the point where it is unfit for many or all uses. Careful planning for the efficient use of water resources can avert inconveniences caused by pollution.

Water resources, therefore, are an important consideration in the comprehensive planning for community water and sewer systems. In the following portion of this report, the existing water resources of the planning area will be briefly reviewed. The discussion will be specifically concerned with the occurrence and availability of both surface and ground water. Also important, and included in Appendix I, are the specific laws and policies of the State of Montana concerning surface and ground-water resources. "Water Quality Criteria," "Water Use Classifications," and "Policy Statements" adopted by the State Department of Health are discussed in detail. Table A in Appendix I outlines present day water quality standards as set forth by the United States Health Service.

## Surface-Water Resources

Deer Lodge County has an extensive drainage system which has primary characteristics of mountainous topography. The entire county is surrounded by mountainous terrain with the Continental Divide and three mountain ranges predominating. The Continental Divide borders Deer Lodge County along a portion of its western county line then crosses through Deer Lodge County in an easterly direction just south of Anaconda. Mountain ranges bordering the county are the Anaconda Range on the west, Flint Creek Range on the north, and the Pioneer Mountains on the south. Elevations in excess of ten thousand feet above sea level occur along the Continental Divide southwest of Anaconda; whereas, an elevation just exceeding 4,500 occurs along the Clark Fork River where it enters Powell County north of Galen.

The headwaters of the Clark Fork are located on the slopes of the Continental Divide in Deer Lodge and Silver Bow Counties. Important drainages in Deer Lodge County which flow north and east into the Clark Fork are Willow, Mill, Warm Springs, Lost, and Race Track Creeks. The North Fork of Flint Creek flows into Georgetown Lake in extreme western Deer Lodge County. Flint Creek flows north from Georgetown Lake to its confluence with the Clark Fork at Drummond. The major drainage feature south of the Continental Divide is the Big Hole River which forms the county line between Deer Lodge and Beaverhead County for more than twenty miles. The Big Hole River flows east and south to its confluence with the Beaverhead River and Ruby River near Twin Bridges in Madison County, thus forming the Jefferson River which is an important tributary of the Missouri River.

The above mentioned streams and their tributaries provide a yearlong source of water for irrigation, livestock, and domestic needs. Several of these streams have gaging stations installed by the United States Geological Survey where flow measurements are taken and recorded at regular intervals. Table 5 includes available data on the drainage

TABLE 5

Stream Gaging Station

| Stream | Gaging Sta. Location | Drainage Area (sq mi) | See Notes | Discharge (cfs) Max. | Date | Min. | Date | Average | Years Averaged | Runoff-(1000 Acre-Ft) Max. | Date | Min. | Date |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Flint Creek | Near Southern Cross | 52.6 | 2 | 174 | 6/13/42 | * | 1932 1952 | 33.4 | 14 | * | * | * | * |
| 2. Race Track Creek | 10 miles north of Anaconda | 39.5 | 3,4 | 515 | 6/14/12 | 16 | 2/3/12 | * | * | * | * | * | * |
| 3. Big Hole River | Near Melrose | 2,470 | 1,2 | 23,000 | 6/14/27 | 49 | 8/17/31 | 1,124 | 22 | * | * | * | * |

Source: "Water Resources Survey" Deer Lodge County, Montana
Montana Water Resources Board, Helena, Montana, 1955

Notes: 1. Irrigation diversions occur above these stations

2. Flow is regulated by one or more reservoirs

3. Only short term or seasonal records available

4. Mining diversions occur above these stations

* Not Recorded

area, discharge, and runoff for three gaging stations pertinent to Deer Lodge County.

Many small reservoirs provide water storage for various uses in Deer Lodge County. One large storage facility is Georgetown Lake located on the county line between Deer Lodge and Granite Counties west of Anaconda. The lake has a storage capacity of 31,000 acre feet which is used primarily for Anaconda Copper Company's supply at Anaconda and for power generation on Flint Creek. Storage in this reservoir began in 1905. The Montana Water Resources Board has published a list of information for all dams and reservoirs which store over fifty acre feet of water. Where the information was available, this list also includes data for privately owned dams and reservoirs.

The climate varies considerably from one area to another because of the wide range of topographic conditions. The effect that topography has on the climate is very important to the water resources. Prevailing west to southwest winds flowing across the high mountains provides the highest annual precipitation values. Average annual precipitation values at the lower elevations in central and northeastern Deer Lodge County are considerably less.

As an example of the net effect of these conditions, a precipitation measuring station at Silver Lake in the mountains west of Anaconda has recorded average annual precipitation figures in excess of twenty one inches. A station located in Anaconda has recorded a thirty year average in excess of fourteen inches, and a precipitation measuring station at the Anaconda Copper Company smelter in east Anaconda has recorded a thirteen inch annual precipitation average for more than fifty years of record.

In general, precipitation occurs as steady rains in the spring months of April through June, intermittent showers throughout the summer and early fall months, and as snowfall during the winter months. The majority of the precipitation in the lower valleys and agricultural areas occurs during the growing season. Precipitation in the mountainous areas is fairly steady throughout the year. Much of the precipitation during the winter months occurs as snowfall, and the resulting heavy snowpack produced in the high mountains each year contributes significantly to the water resources. Snow begins to accumulate in November in the higher mountain valleys and continues to build up until late March or early April. Portions of the high mountain snowpack in Deer Lodge County and in other adjacent drainage areas remain until the warm temperatures of late July and August begin to melt them. The runoff from the snowpack at this time of the year coincides with the period of maximum demand for water in the valleys below.

The use of surface water is widespread for domestic, agricultural, and

recreational purposes. The town of Anaconda uses surface water from Warm Springs Creek as a portion of its municipal supply. The "Water Resources Survey" for Deer Lodge County published by the Montana Water Resources Board in 1955 indicates that at that time nearly 22,000 acres were being irrigated and that a potential existed for more development. The 1964 Census of Agriculture indicates that over eighteen thousand acres were being irrigated at that time. A final but important use of surface water is for recreational purposes. The mountain lakes and streams in the county are ideal habitat for fish and waterfowl and draw many fishermen and hunters to the area each year.

## Water Use Classifications

The Water Pollution Control Council has classified the streams and drainages in Montana according to the water use classification definitions shown in Appendix I. The streams and drainages of Deer Lodge County and surrounding areas are classified as follows:

| | |
|---|---|
| Warm Springs Drainage to Myers Dam | A-Open-$D_1$ |
| Remainder of Warm Springs Drainage | B-$D_1$ |
| Silver Bow Creek (mainstem) from the confluence of Yankee Doodle and Blacktail Deer Creeks to Warm Springs Creek | For industrial waste use |
| Yankee Doodle Creek Drainage to and including the Butte water supply reservoir | A-Closed |
| Remainder of Yankee Doodle Creek Drainage | B-$D_1$ |
| Blacktail Deer Creek Drainage except portion of Basin Creek listed below: | B-$D_1$ |
| Basin Creek Drainage to and including the Butte water supply reservoir | A-Closed |
| Remainder of Basin Creek Drainage | B-$D_1$ |
| All other tributaries to Silver Bow Creek from the confluence of Yankee Doodle and Blacktail Deer Creeks to | B-$D_1$ |

Water-Supply Paper 1862, 55 p.

TABLE 6

Chemical Analysis of Municipal Water Supplies
(All Figures in Milligrams per Liter) *

| City or Town | Anaconda | Anaconda | Galen | Galen | Warm Springs | Warm Springs |
|---|---|---|---|---|---|---|
| Source | Warm Springs Creek | Hoeffner Wells | Layne Wells | Old Well | State Hospital Well #1 | State Hospital Well #2 |
| Date | 3/65 | 3/65 | 4/63 | 9/59 | 11/65 | 11/65 |
| Total Solids | 116 | 174 | 368 | 330 | 400 | 720 |
| Hardness | 102 | 168 | 182 | 231 | 290 | 495 |
| Ca | 33 | 53 | 57 | 58 | 92 | 158 |
| Mg | 5 | 9 | 10 | 21 | 15 | 24 |
| Na+K | 0 | 3 | 44 | 8 | 12 | 42 |
| $CO_3$ | 0 | 0 | 6 | 0 | 0 | 0 |
| $HCO_3$ | 109 | 183 | 250 | 177 | 195 | 275 |
| $SO_4$ | 9 | 19 | 49 | 74 | 143 | 324 |
| Cl | 0 | 2 | 8 | 16 | 3 | 10 |
| $NO_3$ | 0 | 0.7 | 0.4 | 0.7 | 3.1 | 0.0 |
| F | 0.4 | 0.5 | 1.4 | 0.4 | 0.6 | 2.5 |
| Fe | 0.1 | 0.1 | 0.00 | 2.3 | 0.00 | 0.00 |
| As | 0.0 | 0.0 | 0.016 | 0.0 | 0.002 | 0.004 |
| Pb | 0.0 | 0.03 | 0.0 | 0.0 | 0.000 | 0.000 |
| Cu | 0.0 | 0.0 | 0.0 | 0.5 | 0.000 | 0.000 |
| An | - | - | - | - | - | - |

* See Appendix I, Table A, for accepted water quality standards

Source: State Department of Health, Helena, Montana

The complex geology of Deer Lodge County reflects the effects of long periods of deposition of sediments, uplift and deformation, glaciation, and volcanism. During Precambrian time (over 600 million years ago), thousands of feet of sediments were deposited. Sedimentation probably continued (interrupted only by brief periods of uplift and erosion) throughout Paleozoic (225 to 600 million years ago) and Mesozoic

| | |
|---|---|
| Warm Springs Creek | |
| Clark Fork River (mainstem) from Warm Springs Creek to the Little Blackfoot River | $C\text{-}D_2$ |
| Tin Cup Joe Creek Drainage to the Deer Lodge water supply intake | A-Closed |
| Remainder of Tin Cup Joe Drainage | $B\text{-}D_1$ |
| Georgetown Lake and tributaries above Georgetown Dam | $A\text{-Open-}D_1$ |
| Big Hole River Drainage (tributary To the Jefferson, tributary to the Missouri River) above Divide | $A\text{-Open-}D_1$ |
| Remainder of the Big Hole Drainage | $B\text{-}D_1$ |

## Ground-Water Resources

Ground water is the most widely used source of domestic and stock water in Deer Lodge County. As of January 1970, the Montana Bureau of Mines and Geology in Butte had on record 586 appropriations for wells and ninety two appropriations for springs. A total of 448 wells were appropriated for domestic use, twenty two for stock use, forty two for both domestic and stock use, thirty three for irrigation, and eight for industrial use. A total of twenty four springs were appropriated for stock use, eighteen for domestic use, eight for both stock and domestic use, and twenty three for irrigation; the use of seventeen springs was not reported. State Department of Health records indicate that Anaconda, county seat of Deer Lodge County, obtains water for municipal use both from Warm Springs Creek and drilled wells. Galen and Warm Springs State Hospitals obtain water for institutional use from drilled wells. (See Table 6 for chemical analysis of these water supplies.)

Technical reports that discuss ground water of parts of Deer Lodge County are as follows: Perry, E. S., 1934, Physiography and ground-water supply in the Big Hole basin, Montana: Montana Bur. Mines and Geology Mem. 12, 18 p.; Konizeski, R. L., McMurtrey, R. G., and Brietkrietz, Alex, 1962, Preliminary report on the geology and ground-water resources of the southern part of the Deer Lodge Valley, Montana: Montana Bur. Mines and Geology Bull. 31, 23 p.; Konizeski, R. L., McMurtrey, R. G., and Brietkrietz, Alex, 1968, Geology and ground-water resources of the Deer Lodge Valley, Montana: U. S. Geol. Survey

(65 to 225 million years ago) time. Uplift, deformation, and erosion of the sediments began near the end of Mesozoic time and continued into Cenozoic time (less than 65 million years ago). During this period of disturbance igneous rocks intruded into the sediments. These intrusive rocks then cooled and solidified and became exposed at the ground surface due to continued erosion and uplift. During the Tertiary age (one to 65 million years ago), sediments eroded from the surrounding mountains along with material from volcanoes and collected in the Deer Lodge and Big Hole Valleys. During Pleistocene time (twenty thousand to one million years ago), high mountain glaciers deposited a heterogeneous mixture of boulders, gravel, sand, and clay in some stream drainages. Pleistocene and Recent (less than twenty thousand years old) unconsolidated deposits of silt, clay, sand, and gravel were deposited along streams in the county.

Rocks important to the water resources of Deer Lodge County include Precambrian sediments, Paleozoic sediments, igneous rocks of Cretaceous and Tertiary age, Tertiary sediments, and Recent alluvium.

Precambrian sediments are exposed at the ground surface in relatively small scattered patches in central, southern, and western Deer Lodge County. Very fine-grained and tightly compacted argillite and limestone are the predominant rock types. These rocks normally store and transmit little ground water. However, in zones that have been fractured and broken, enough water of good quality is generally available for stock or domestic use.

Paleozoic sediments, composed mainly of layers of shale, limestone, and sandstone, are found exposed in mountains in the northern part of the county and in small areas along the southeastern border of Deer Lodge County. The older Paleozoic rocks exposed in northwestern and southeastern Deer Lodge County are generally poor aquifers (water yielding materials) and are not used to any great extent as a source of ground water. Some of the younger Paleozoic rocks exposed, such as the Madison Limestone and the Kootenai Formation, are known to be good aquifers in other parts of Montana. In Deer Lodge County these formations have not been developed. Near the exposures of the Kootenai and the Madison, abundant water of fair to good quality can probably be obtained from wells drilled into these formations.

Igneous rocks Cretaceous and Tertiary in age are exposed in the southwestern, central, and northeastern parts of Deer Lodge County and in small patches throughout the county. These rocks normally have low permeability (ability to transmit water) except where they are weathered and broken. Small to moderate amounts of good quality water for stock or domestic use can be produced from wells penetrating

fractured and broken zones in igneous rocks.

Sediments of Tertiary age (one to 65 million years old) are present in the Deer Lodge Valley in northern Deer Lodge County and in the Big Hole River valley in southern Deer Lodge County. These sediments are composed of material eroded from the surrounding mountains and some material ejected from ancient volcanoes. Tertiary strata underlie most terrace deposits in the county and are overlain by Quaternary alluvium. Tertiary deposits are mostly unconsolidated to semiconsolidated mixtures and layers of sand, gravel, silt, and clay with numerous ash and bentonite layers. Tertiary sediments outcrop in broad zones between the mountain fronts and the center of the Deer Lodge and upper Big Hole Valleys. About two thousand feet of Tertiary sediments are exposed in the Deer Lodge Valley, and gravimetric studies conducted by the U. S. Geological Survey indicate the maximum thickness of these sediments to be more than 5,500 feet. The upper few hundred feet of the Tertiary sediments generally produce moderate amounts of fair to good quality water to wells for stock and domestic use. Some zones in the Tertiary are capable of yielding large quantities of water to properly constructed wells. Ground water in Tertiary sediments is recharged by infiltration of precipitation and irrigation water. Ground water generally moves toward the valley bottoms and discharges into streams.

Alpine glaciation was widespread in the Flint Creek Range during Pleistocene time. Glaciers moved down mountain drainages and left morainal deposits at the mouths of the canyons. The moraines are composed of heterogeneous mixtures of sand, gravel, silt, and clay and vary in thickness from a few feet to over one hundred feet. Moraines are generally poor sources of ground water. Outwash deposits of sand and gravel are commonly present in glaciated valleys. Such deposits where sufficiently thick will yield moderate amounts of water to wells. Glacial deposits are not widespread and are not used as a source of water in Deer Lodge County.

Deposits of Recent alluvium, unconsolidated mixtures of clay, silt, sand and gravel are found along the flood plains of the Clark Fork, the Big Hole River, and their tributaries. This alluvium is the most widely used source of ground water in the county. The alluvium covers a considerable area and ranges in thickness from ten to one hundred feet. Abundant supplies of good quality water adequate for stock and domestic purposes are obtained from wells drilled into this material. Where there is a considerable thickness, the alluvium will yield adequate water for irrigation. Wells located nearest the two major streams produce the most water.

The ground-water resources of Deer Lodge County are relatively undeveloped. The occurrence of ground water in the bedrock is

dependent on the complex geology of this county. Ground water is widely available in Tertiary sediments and Recent alluvium. Future development of ground water in the county is expected for stock and domestic purposes. In selected areas sufficient ground water is available for additional municipal, irrigational, and industrial purposes, and future development of water for these purposes should accelerate.

Sources:
1. M. K. Botz, Montana Bureau of Mines and Geology, Butte, Montana, 1970
2. State Department of Health, Helena, Montana
3. "Water Resources Survey" Deer Lodge County, Montana, Montana Water Resources Board, Helena, Montana 1955

## THE SOILS

### General

General descriptions of soils in specific areas are useful in predicting the potential problems which might be encountered during private and public works construction. Deer Lodge County has an interesting and complicated geologic history which has greatly influenced the soil structure of the area. The dominating physiographic features are the stream valleys bordered by high mountain ranges.

As a result of glaciation in the area, portions of the county are covered by glacial deposits including till. Till is generally defined as nonsorted and nonstratified sediment carried or deposited by a glacier. Also, extensive drainage throughout the area over periods of time has resulted in the filling of many stream valleys with alluvium. The soils of Deer Lodge County are made up of the alterations of the till, alluvium, and other geologic parent materials due to various conditions of climate, topography, and living organisms.

### Soil Map

The Soil Conservation Service of the United States Department of Agriculture has prepared a general soil map for Deer Lodge County. The map as presented by them is shown in this report as Map 4. In developing this map, the Soil Conservation Service made field studies and observations which resulted in the designation of ten soil areas. Each area, as a rule, contains a few major soils and several minor

soils. Soils within an area may differ greatly in short distances and any one soil may occur in more than one area. Thus, the general soil map does not show the kind of soil at any particular point but shows specific patterns of soils.

The Soil Conservation Service is continuing to expand the detailed study of Deer Lodge County. Information regarding specific areas is available from the Soil Conservation Service office in Deer Lodge, and it is recommended that all available data be utilized during the planning of public works projects. In addition, on site soil investigations for specific projects provide invaluable information.

The Soil Conservation Service preliminary draft descriptions of the ten soil areas shown on the general soil map are presented as follows:

1. Poorly Drained Loamy Soils. These are areas dominated by nearly level, poorly drained, loamy soils fifteen to sixty inches deep over sand and gravel.

2. Cool Loamy Grassland Soils on Benches and Fans. These are areas dominated by gently sloping, dark colored, deep, loamy soils on terraces and shallow to moderately deep loamy soils on outwash fans.

3. Cool Clayey Grassland Soils. These are areas dominated by sloping to steep, dark colored, deep soils with loamy surfaces and clayey subsoils.

4. Cool Loamy Grassland Soils on Igneous Bedrock. These are areas dominated by dark colored, loamy soils more than forty inches deep over bedrock. Slopes are dominantly ten to forty percent.

5. Cold Loamy Grassland Soils on Glacial Moraines. These are areas dominated by deep, dark colored, loamy soils on undulating to steep short irregular slopes of two to thirty percent.

6. Cold Clayey Grassland Soils. These are areas dominated by deep, dark colored soils with loamy surfaces, clayey subsoils and calcareous clayey substratum. Slopes are dominantly five to twenty percent.

7. Cold Loamy Forested Soils on Igneous Bedrock. These are areas dominated by sloping to very steep, light colored loamy soils with gravelly substratum and less than sixty inches deep to bedrock.

8. Cold Loamy Forested Soils on Glacial Moraines. These are areas dominated by light colored, deep, loamy soils with gravelly subsoil and substratum on slopes up to thirty five percent.

9. Cold Loamy Soils on Metamorphic Bedrock. These are areas dominated by light colored, deep loamy soils with gravelly subsoil and substratum. Slopes are dominantly steep to very steep.

10. Alpine-Rockland. These are areas dominated by shallow and very shallow soils and rockland on very steep high mountain peaks.

## Conclusions

The soils of Deer Lodge County have generally been easy to deal with where shallow domestic water wells and individual sewage drainfields have been constructed. The large amounts of glacial till and alluvium have been found to be extremely variable in permeability, however. This has had an effect on both the quantity of water available in shallow domestic wells and the successful operation of individual sewage drainfields. Some areas of extensive clay and silt deposits require special care in the construction and operation of septic tank drainfields.

Construction of municipal water and sewer systems in the various soils of Deer Lodge County has not been found to be difficult. Pipeline trench digging in the sands and clays is extremely easy while the coarse materials such as stream gravels slow operations somewhat. Bedrock at shallow depths is not common in the valley bottoms; however, it can be expected at normal water and sewer line installation depths near the toe of the mountain slopes.

Source: U. S. Department of Agriculture, Soil Conservation Service, Deer Lodge, Montana

# COMMUNITY WATER SYSTEM FACILITIES

## General

This comprehensive report covers the overall problems, existing or projected, for Deer Lodge County, Montana. The volume of data processed and evaluated and the intent of the report allow only a general analysis of any one system.

The intent of this report is to point out the general needs of each community with the objective that each community may in the future be provided with a safe and adequate water system. The general solutions to overall problems suggested in this report may have to be modified when detailed studies are made. These modifications may be in exact size of parts of a system or in some detailed design variation but will

not detract from the overall value of the general information presented.

Basically, the demand for water from community systems is for domestic, fire fighting, and industrial uses. The demand for industrial water supply in small communities has not been extensive in Montana and in most cases will not control the design of community systems. Sufficient water for fire fighting must be considered; however, economic feasibility will usually control the extent of such facilities. In most small communities a system with sufficient capacity to give high ratings for fire protection would require facilities considerably larger than necessary for domestic purposes. The community might be unable to finance such an improvement; the approach, therefore, has been to propose a system suitable for present domestic needs. These basic facilities can be expanded for more complete service and for higher fire ratings as it becomes economically feasible.

The domestic use of water has increased greatly in recent years. This is partially due to improved economic conditions which make it possible for families to acquire such water consuming appliances as dishwashers, waste disposal units, and automatic washing machines. Water use for beautifying property has also increased. The most essential condition is adequate, safe, and potable water for domestic purposes, and this has been the primary consideration in this study. Appendix II contains further information on analysis criteria.

## Basic Considerations

Communities studied in this comprehensive plan were those with a minimum of five potential users and a maximum population of 5,500. Each community within this category was visited at least once. During these visits the type of water facilities available was examined, and an evaluation of the facilities was made from the standpoint of fulfilling the needs of the residents.

The existing systems were found to be quite varied in their operation, condition, and suitability for serving the needs of the users. The situation in each community was evaluated separately; however, some general classification of the various systems was possible. These are described briefly in the following paragraphs so that the general philosophy of the analysis can be shown.

1. In some communities the homes are quite widespread and few in number. Good water in adequate quantities can be found at reasonable depths, and for such situations private wells will provide a safe and suitable water system.

2. Many communities have had access to good water from private wells for many years. In some of these communities population is increasing, and the area is becoming more densely settled. As a result, tests for bacteriological quality of well water occasionally indicate that pollution is present. When this occurs, it is usually the beginning of a problem which will continue to worsen. Increasing population and a higher potential for contamination indicate the need for a safe community water facility. The system should be one which will serve the domestic needs of the present residents with provisions for improvements and expansion as needed.

3. Many communities have enjoyed a central water system for years but have not made annual improvements and replacements. This has resulted in overloaded and antiquated systems. Suggestions for immediate improvements which will fit into an overall replacement program are included in this report.

4. Some communities which have experienced a steady population growth are finding that their water systems are inadequate for present demands and will require enlargement. Population projections and economic trends are used to determine the need for improvements and also to justify the type and extent of proposed improvements.

## Deer Lodge County

The estimated 1970 population of Deer Lodge County is 15,500. Approximately twelve thousand, or seventy seven percent, of these people are presently served by central water systems in Anaconda, Warm Springs, and Galen, and the remainder are served by private facilities such as wells and springs. By 1990 about fourteen thousand, or eighty two percent of the population, will have access to central water systems if the schedule of proposed improvements is followed. It is expected that the remaining eighteen percent will live in outlying areas, and the homes will not be close enough together to make central systems feasible.

## Opportunity

Existing System. The estimated 1970 population of Opportunity is 830. The people in Opportunity obtain their water from individual wells. The volunteer fire department of Opportunity has several driven wells with fire hydrants installed for use in fire emergencies only. The first ground water below the surface is of poor quality; however, the second flow is good. There has been no problem obtaining plenty of ground water from individual wells. The depth of the individual wells in opportunity ranges from approximately twenty six feet at the first water to thirty five to forty two feet at the second water.

There has been some well contamination reported in the shallow wells. A relatively high ground-water level exists in the area, and the fluctuation of this level due to surface runoff contributes to the contamination problems. A private engineering firm has proposed to conduct a preliminary feasibility study for central water and sewer systems in Opportunity, and because of the problems that do exist the recommendations of this report should be followed.

Improvements Next Five to Ten Years. The 1975 population is expected to be 875. It is proposed that a central water facility be constructed during this time, and the layout of a facility which would serve the community adequately is shown on Map 5. A source with a capacity of five hundred gallons per minute (gpm) and storage with a capacity of 200,000 gallons would be necessary to serve the community of this size. Area well records indicate that a well capable of producing two hundred to three hundred gpm could be located near the community. Storage for such a central water system could be provided by a 200,000 gallon elevated storage tank located within the community. Two wells as shown could combine to provide the adequate supply required; however, further study and actual well tests may indicate that one source could be developed. Also, storage located at higher elevations beyond the community may prove to be more economical than that provided by an elevated storage tank within the community. Supply and distribution piping with minimum diameters of eight and ten inches would be necessary to provide adequate flow and pressure throughout the system.

Improvements by 1990. The 1990 population of Opportunity is expected to be nine hundred. The system as proposed in the five to ten year plan would continue to serve the community adequately, and it is not anticipated that any further improvements would be necessary during this period.

## Georgetown Lake Area

Existing System. The Georgetown Lake area and current land use are shown on Map 6. Much of the development at the lake is in Granite County; however, a comprehensive plan for future improvements will have to include the entire recreational area without regard to county lines.

The Georgetown Lake area is primarily a summer recreation site. There are several clusters of summer homes around the lake and also across Highway 10A to the northeast. Points of considerable development are the Georgetown Boat Club near the dam at the north end of the lake and Denton's Point at the southern end of the lake. There is also significant development along Highway 10A and near the community of Southern Cross. In general, the occupation of these facilities is seasonal.

The present sources of water supply for these developments are individual wells. The water quality is good and quantities available are more than adequate. Some of the wells are less than thirty feet deep while others range between thirty and one hundred feet in depth. There is concern that some of the more densely occupied areas may be experiencing some contamination due to sewage effluents in the area. Also, it is felt that the quality of the lake water is deteriorating at least partially due to the sewage effluents which are currently allowed to enter.

Improvements by 1990. A comprehensive plan for future development is currently being prepared by the Forest Service and the Anaconda Company, the two major owners of land near Georgetown Lake. If the recommendations of the plan are carried out, it is reasonably certain that contamination of ground-water supplies and lake water will be eliminated. Individual water supply systems will continue to be the most practical means of service for widely spread summer homes, and small central water systems for areas such as Denton's Point will need to be considered during the planning period.

## COMMUNITY SEWER SYSTEM FACILITIES

### General

Each use of water adds some material or alters some characteristic enough to change the original quality of the water and often to pollute it. The transportation and dilution of municipal, industrial, and agricultural wastes are important and necessary uses of water; therefore, special emphasis is placed on the control of water pollution from these sources. Some of these wastes can be carried in limited amounts without damage to the resource. Some wastes if discharged into water courses can make their way into underground aquifers and pollute the ground water so that it is unsuitable for further use.

Pollution by definition and interpretation is a matter of degree. Since it is inevitable that the quality of water will be altered with each use, it is of critical importance to control the degree of pollution.

It is public policy established by the state legislature to maintain reasonable standards of purity for the water of the state. These standards are to be consistent with the use of these waters, including their use in carrying away the water borne waste products of society. The current Federal Water Pollution Control Act in reference to pollution abatement gives the individual states discretion in

assessing the physical and economic feasibility of complying with water quality standards. The "Water Quality Criteria," "Water Use Classifications," and "Policy Statements" of the Montana Water Pollution Control Council for streams and rivers in Montana have been included in Appendix I.

Sewage may be broadly categorized as domestic or municipal waste, industrial waste, and animal or agricultural waste. Animal wastes are usually not involved in community sewage facilities; however, they do constitute a potential source of pollution which must be controlled and prevented from entering streams or other potential water supplies.

Although industrial activity throughout Montana has been limited, the need for control and treatment of industrial wastes is apparent. Industrial wastes vary in quantity and composition as greatly as the products and processes which generate them. They include toxic chemicals, solids carried in suspension, brines, strong acids and alkalies, oils, dyes, floating solids, and the heat generated by industrial processes. Industrial wastes are not found to be a major factor in the design of most community sewage facilities. Where economic projections indicate industrial development, the relationship to loading on domestic sewer systems is considered.

Domestic sewage is the primary consideration of this study and has been the basis for design and analysis. Where particular systems are subjected to loading from industrial sources, a more detailed study will be necessary. The general approaches outlined in "Analysis Criteria" in Appendix III will suffice in practically all cases.

## Basic Considerations

There are generally three main methods of sewage disposal. These are septic tanks, mechanical sewage treatment plants, and wastewater stabilization ponds. Local soil conditions, availability of land, and density of population are the basic factors which govern the selection of a particular method.

Many of the smaller communities have relied on individual septic tanks and cesspools for each home to handle sewage disposal. Septic tanks are suitable if the population density is low and if the systems are properly designed and maintained. Overflow from these tanks must drain into the soil and, depending on local soil conditions, may or may not create a problem. There is a limit to the amount of water that even loose granular soil can absorb. Density of population and the length of time the effluent has been entering the soil are factors which indicate whether septic tanks can be suitable for sewage disposal.

When economically feasible, community sewage collection and disposal systems are much more desirable than individual systems. Community systems eliminate the worry of septic tank failure, the danger of well contamination, and the problem of soil saturation. However, it is usually uneconomical to serve a few homes scattered over a large area with a community sewer system.

The type of sewage disposal facilities to be used can generally be determined on the basis of economic factors. Mechanical treatment plants provide an excellent means of sewage disposal although the initial cost, maintenance cost, and power cost are usually high. Wastewater stabilization ponds are an ideal method of sewage disposal and usually are the most economical to construct and maintain.

The Montana Water Pollution Control Council has established the criteria that treatment of domestic and industrial wastes shall be secondary treatment or its equivalent. For domestic sewage, mechanical treatment plants or stabilization ponds, when either is properly designed, constructed, and operated, meet these requirements.

A schedule for completion of secondary treatment facilities by communities across the state has been established by the State Department of Health. The target date is included for individual towns when applicable.

## Deer Lodge County

In Deer Lodge County only the city of Anaconda and the State Hospitals at Warm Springs and Galen are served by central sewer facilities. Approximately twelve thousand people, or seventy seven percent of the county population, are served by these facilities. By 1990 approximately fourteen thousand, or eighty two percent of the population, will have access to community sewer facilities if the proposed expansion program is followed. The remaining percentage will live in outlying areas, and the homes will not be close enough together to make community sewer systems feasible.

## Opportunity

Existing System. The 1970 population of Opportunity is estimated to be 830. This population is expected to increase steadily throughout the planning period. The present method of handling sewage in the community of Opportunity is by septic tanks, cesspools, and other individual means. There is a high ground-water table in this area, and there have been reports of septic tank drainfield problems and shallow well contamination. There has been consideration of a central

sewer system in the community, and a private engineering firm has been engaged to conduct a preliminary feasibility study for such a system. Due to the reported problems which do exist with individual systems in the area, it is recommended that the findings of the engineering study be reviewed and that action be taken as soon as practical.

Improvements Next Five to Ten Years. The population is expected to be 875 by 1975. It is recommended that a central sewer system be constructed during this time, and a layout which would serve the community adequately is shown on Map 7. The system as shown would operate entirely by gravity through a collection network consisting of eight inch diameter pipe and an outfall line of ten inch diameter pipe. Treatment for the system would be provided by a nine acre wastewater stabilization pond located northeast of the community. Further engineering study may indicate that a lift facility would be necessary to provide adequate service to the southern area of the community. Exact location of the wastewater stabilization pond will also depend on further study of land acquisition possibilities.

Improvements by 1990. The population is expected to be nine hundred by 1990. The system as discussed in the five to ten year plan will be adequate to serve the needs of this community throughout the remainder of the planning period. Annual maintenance of the system will be necessary to keep it operating properly; however, the only improvements which would be necessary will be the expansion of the collection system to handle growth areas.

## Georgetown Lake Area

Existing System. The Georgetown Lake area and current land use are shown on Map 6. The summer homes and recreational facilities in the area use septic tanks, cesspools, pit privies, and other individual systems for disposal of sewage. Indications are that construction and use of these facilities has reached a point where contamination of ground water and lake water is evident. The two major landowners in the area, the Forest Service and the Anaconda Company, have decided to prepare a comprehensive plan for development of the lake shore and adjacent lands.

A meeting was held in May 1970, at which representatives of the Forest Service, the Anaconda Company, the State Department of Health, the Department of Fish and Game, and the Federal Water Quality Administration were present. It was reported that the present land use consists of four campgrounds with a total of 143 units, ninety five recreation residences, four commercial establishments, and twenty four boat docks. Present rates of increase in use indicate that by 1980 Forest Service facilities alone will have to be increased five times to

adequately handle the people.

Various methods of sewage disposal, both individual and collective, were discussed. Methods of implementing the suggested comprehensive plan include private systems, sewer districts established through local government, and sewer utilities established through private or government means. The possibility of the use of several types of sewage disposal and several means of implementation is apparent. A probable means of sewage disposal for shore line areas of concentrated development is collection of sewage at a central point, lifting to a location remote from the lake, and treatment by wastewater stabilization ponds or mechanical treatment plants.

Improvements Next Five to Ten Years. As mentioned above, a substantial increase in the use of the Georgetown Lake area is predicted for the next ten years. It is recommended that following completion of the proposed comprehensive development plan all effort be concentrated on meeting the established requirements. Necessary planning for construction of central sewer facilities at developments such as Denton's Point should begin at this time. Individual homesites which are not within practical distance of other development to warrant combining systems, should construct individual facilities which meet all current design and construction standards.

Improvements by 1990. It is expected that during this portion of the planning period the development will be proceeding according to the proposed comprehensive plan. Detailed study of individual requirements will continue to be necessary before the most economical methods of sewage disposal can be established.

## PREFACE TO MAPS

The following maps have been prepared from several sources. The county maps were prepared from Transverse Mercator Projection Series Maps and Montana Highway Department Maps, Planning and Survey Series. The reduction of the county maps necessary for this publication makes them useful for general reference purposes only.

The town and community base maps used herein are taken from Montana State Highway Commission City and Town Plats prepared from aerial photographs dated 1961 to 1969 and have been updated where necessary. On-site surveys, plats obtained from individual towns, and aerial photography conducted in 1970 were also used. Uncontrolled mosaics have been used and scales are, accordingly, only approximate and are shown for referencing purposes only. The mapping operation was supplemented by field checks made during 1970.

Land use information was obtained by field surveys, supplemented and checked by aerial photography during 1969 and 1970.

Water and sewer systems maps show existing facilities for individual towns and communities except where the information was not available. Data concerning these community facilities was obtained from the records of the individual communities and of the State Department of Health. Water and sewer lines are shown in the center of streets to indicate the existence of lines rather than precise locations. The sizes of lines, obtained from the most current information available, are indicated when possible. The locations of recommended improvements are given as relative locations and are not meant to be scaled from the individual town or community maps.

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| DEER LODGE COUNTY LAND OWNERSHIP | 3 |
| DEER LODGE COUNTY SOILS | 4 |
| OPPORTUNITY WATER SYSTEM | 5 |
| GEORGETOWN LAKE AREA | 6 |
| OPPORTUNITY SEWER SYSTEM | 7 |

# MAP I

# COUNTY MAP
## GENERAL RELIEF

LEGEND

CITIES-TOWNS

COUNTY SEAT

ROADS-HIGHWAYS
STATE HIGHWAY U. S. HIGHWAY

RAILROADS

STREAMS-LAKES

COUNTY BOUNDARY

INDIAN RESERVATION

0-3,000 FT. ELEVATION

3-5,000 FT. ELEVATION

5-7,000 FT. ELEVATION

OVER 7,000 FT. ELEVATION

# MAP 2

# LEGEND

## MAJOR STATE-WIDE COVERAGE

### POWER AND GAS SYSTEMS

- ☐ POWER PLANT (IN MEGAWATTS)
- ---- 1 to 50 KILOVOLTS
- ——— 51 to 100 KILOVOLTS
- —·—·— 101+ KILOVOLTS
- ····· PROPOSED LINES
- —•—•— GAS LINES

### RECREATION AREAS

1. LOST CREEK STATE PARK
2. LEWIS AND CLARK CAVERNS STATE PARK
3. LAKE MARY RONAN STATE PARK
4. MEDICINE ROCKS STATE PARK
5. ROSEBUD STATE PARK
6. ROCK CREEK STATE PARK
7. MAKOSHIKA STATE PARK
8. WEST SHORE STATE PARK
9. WOODS BAY STATE PARK
10. BITTERROOT LAKE STATE PARK
11. ASHLEY LAKE STATE PARK
12. LONE PINE STATE PARK
13. JAMES KIPP STATE PARK
14. HOOPER MEMORIAL STATE PARK
15. HELL CREEK STATE PARK
16. FINLEY POINT STATE PARK
17. ELMO STATE PARK
18. FLATHEAD LAKE STATE PARK
19. YELLOW BAY STATE PARK
20. WALSTAD MEMORIAL PARK
21. THOMPSON FALLS STATE PARK
22. WHITEFISH LAKE STATE PARK
23. WAYFARERS RECREATION AREA
24. TIBER RESERVOIR RECREATION AREA
25. CLARK CANYON RESERVOIR RECREATION AREA
26. ENNIS RECREATION AREA
27. DEADMAN'S BASIN RESERVOIR RECREATION AREA
28. PAINTED ROCKS RESERVOIR RECREATION AREA
29. CANYON FERRY RECREATION AREA
30. LOGAN PARK RECREATION AREA
31. NELSON RESERVOIR RECREATION AREA
32. BEAVERTAIL HILL RECREATION AREA
33. GLACIER NATIONAL PARK
34. YELLOWSTONE NATIONAL PARK

▨ NATIONAL FORESTS

# MAP 3

# COUNTY MAP
## LAND OWNERSHIP

## LEGEND

CITIES-TOWNS

COUNTY SEAT

ROADS-HIGHWAYS
STATE HIGHWAY U. S. HIGHWAY

RAILROADS

STREAMS-LAKES

COUNTY BOUNDARY

INDIAN RESERVATION

PRIVATELY OWNED LAND

STATE OWNED LAND

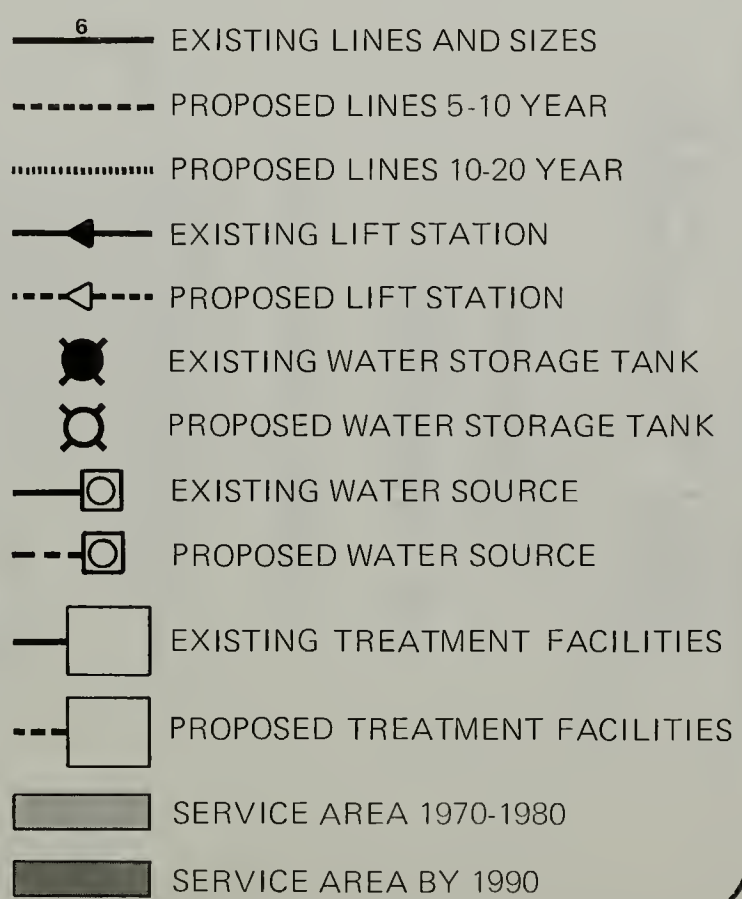
FEDERAL OWNED LAND

# CITIES MAP LEGEND

## LAND USE

- SINGLE RESIDENCE
- DILAPIDATED RESIDENCE
- SINGLE TRAILER RESIDENCE
- MULTIPLE RESIDENCE
- APARTMENTS
- TRAILER COURT
- COMMERCIAL BUILDING
- HOTEL-MOTEL
- PUBLIC BUILDING
- SCHOOL
- CHURCH
- HOSPITAL
- INDUSTRIAL
- GRAIN ELEVATOR

## WATER and SEWER SYSTEMS




- EXISTING LINES AND SIZES
- PROPOSED LINES 5-10 YEAR
- PROPOSED LINES 10-20 YEAR
- EXISTING LIFT STATION
- PROPOSED LIFT STATION
- EXISTING WATER STORAGE TANK
- PROPOSED WATER STORAGE TANK
- EXISTING WATER SOURCE
- PROPOSED WATER SOURCE
- EXISTING TREATMENT FACILITIES
- PROPOSED TREATMENT FACILITIES
- SERVICE AREA 1970-1980
- SERVICE AREA BY 1990

GALEN
GEORGETOWN LAKE
GEORGETOWN
ECHO LAKE
SILVER LAKE
U.S.
ALT.
BUTTE ANACONDA
10
ANACONDA
MILE CREEK
LOST DUTCHMAN CREEK
RAILROAD
FORK
WARM SPRINGS
STATE HIGHWAY 48
NORTHERN
HIGHWAY
OPPORTUNITY
SILICA
A&
BURLINGTON
U.S.
PACIFIC
WEST FORK LA MARCHE CR.
N
DEER LODGE COUNTY
TOPOGRAPHY
SCALE
5 0 5 10 Miles

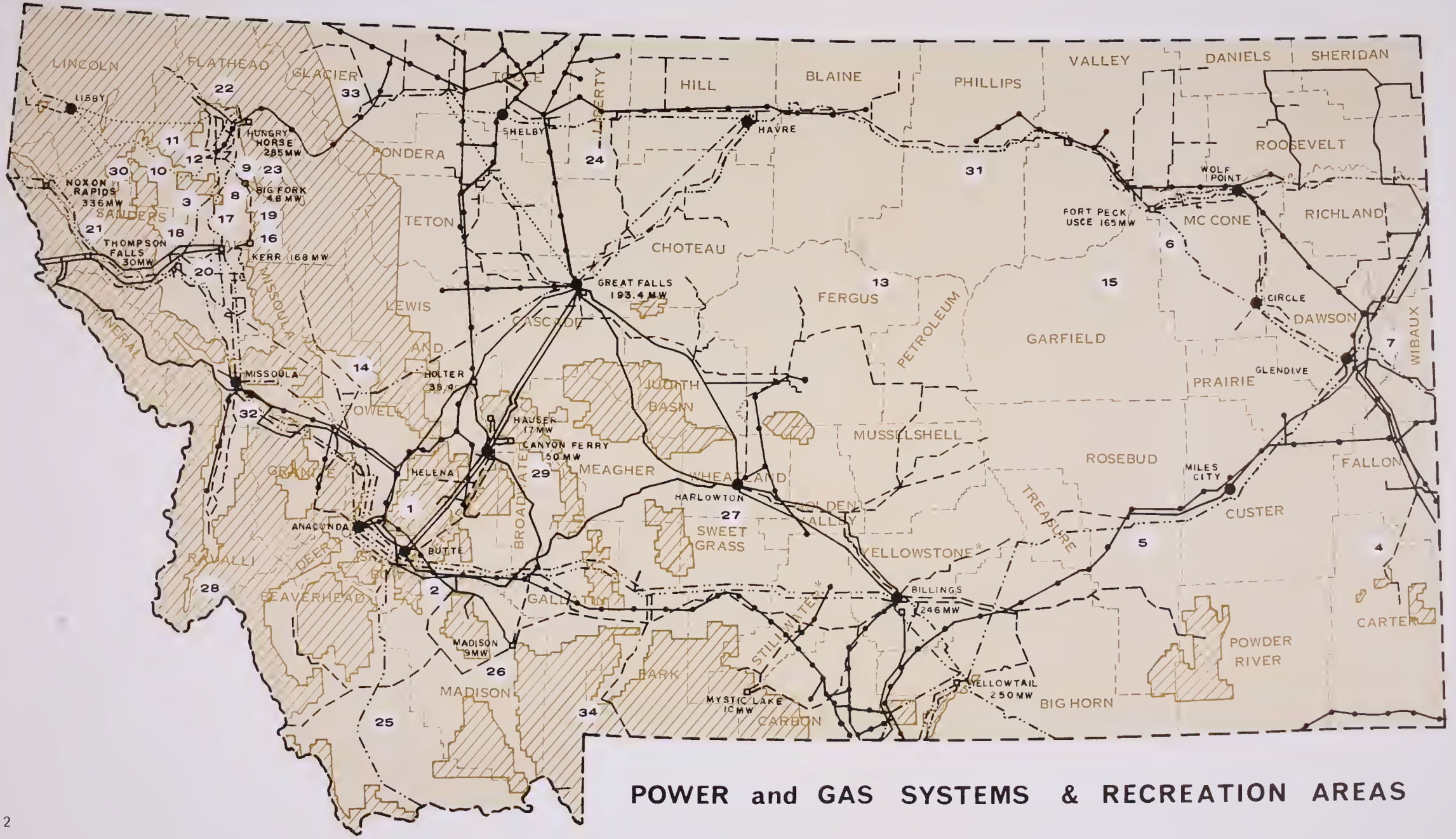
MAP 1

.ODGE COUNTY
ND OWNERSHIP



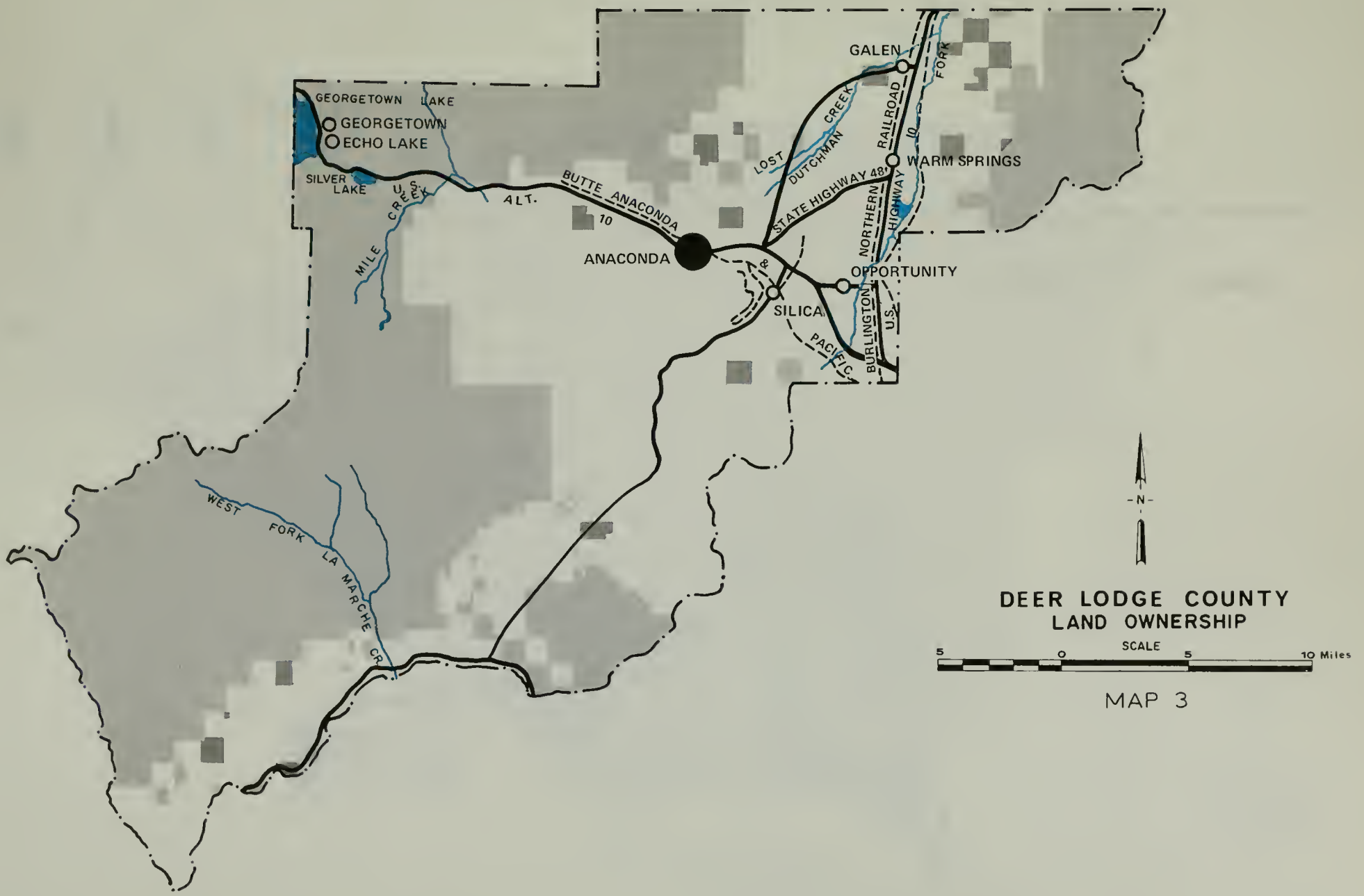

MAP 3

MAP 2




# POWER and GAS SYSTEMS & RECREATION AREAS

MAP 2


GALEN
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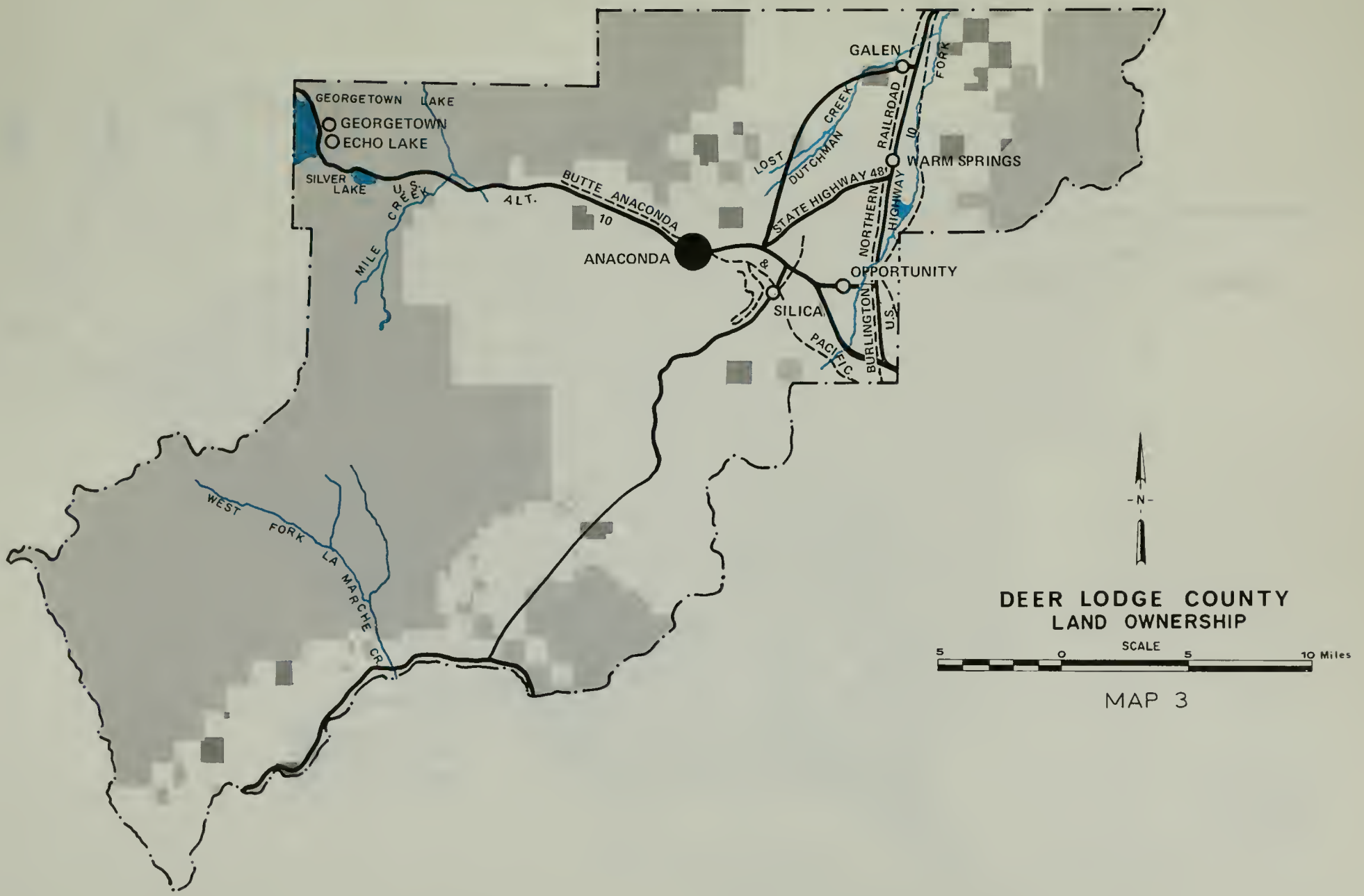
GEORGETOWN LAKE
GEORGETOWN
ECHO LAKE
SILVER LAKE
U.S.
CREEK
ALT.
BUTTE ANACONDA
10
LOST DUTCHMAN CREEK
RAILROAD
10
WARM SPRINGS
STATE HIGHWAY 48
NORTHERN
HIGHWAY
MILE
ANACONDA
OPPORTUNITY
SILICA
BURLINGTON
U.S.
PACIFIC
WEST FORK LA MARCHE CR.
N
DEER LODGE COUNTY
LAND OWNERSHIP
SCALE
5 0 5 10 Miles

MAP 3


GALEN
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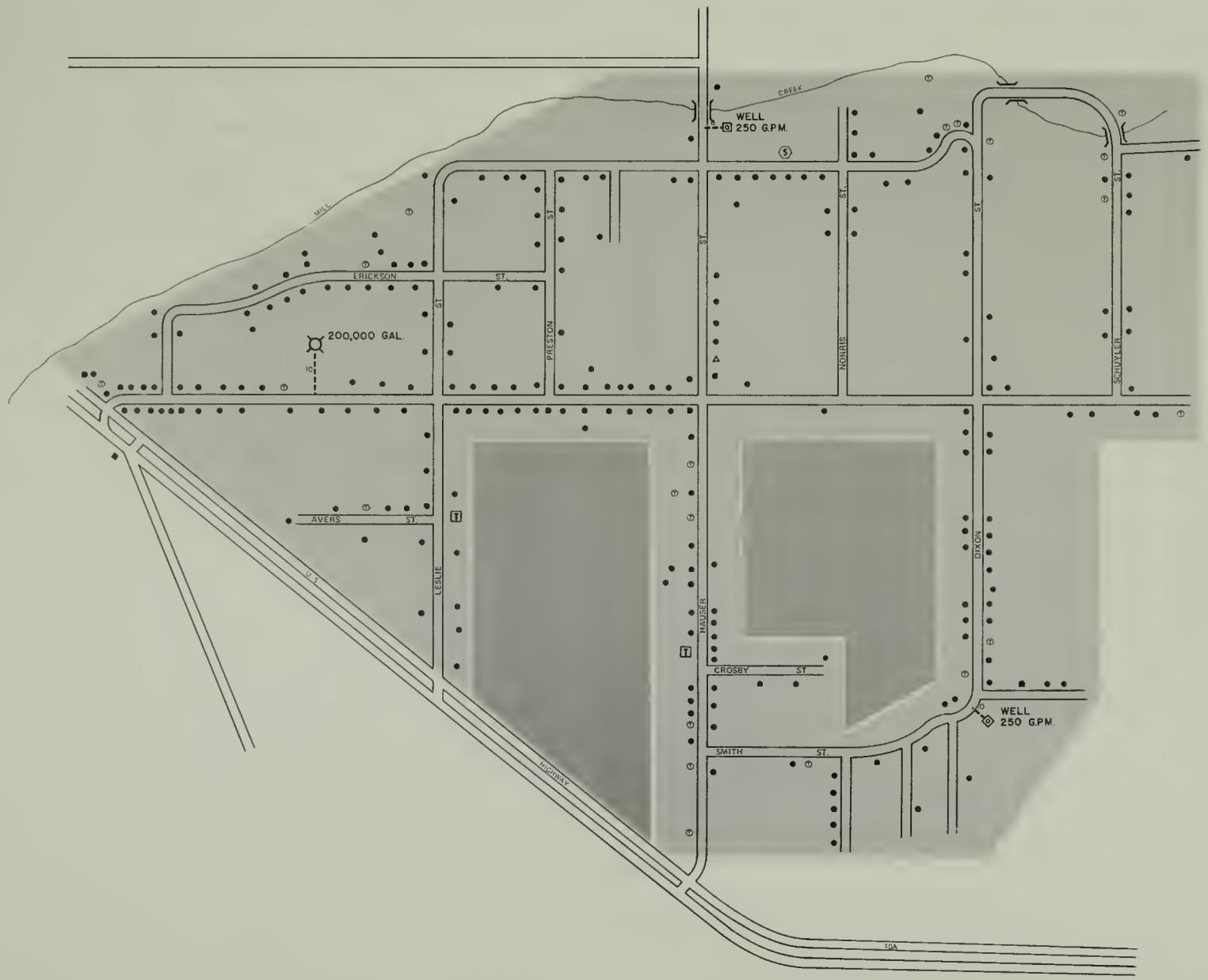
GEORGETOWN
ECHO LAKE
SILVER LAKE
U.S.
CREEK
ALT.
BUTTE ANACONDA
10
LOST
DUTCHMAN
CREEK
RAILROAD
10
WARM SPRINGS
STATE HIGHWAY 48
NORTHERN
HIGHWAY
MILE
ANACONDA
OPPORTUNITY
SILICA
BURLINGTON
U.S.
PACIFIC
WEST
FORK
LA MARCHE
CR
-N-
DEER LODGE COUNTY
LAND OWNERSHIP
SCALE
5
0
5
10 Miles

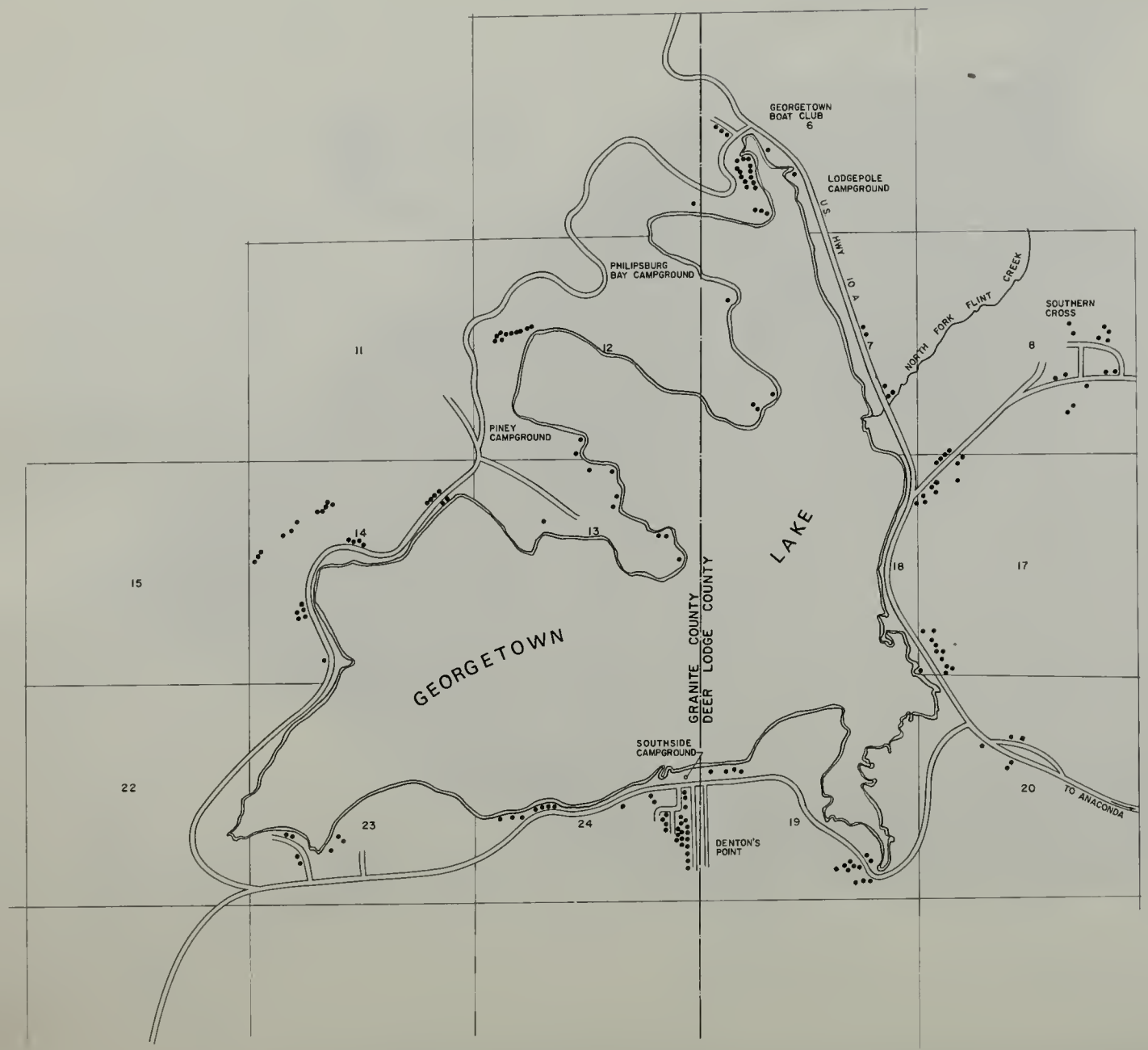
MAP 3

NOTE: Numbers correspond to soils descriptions listed in the text.
SOURCE: USDA Soil Conservation Service




N

**OPPORTUNITY**
WATER SYSTEM
SCALE
MAP 5

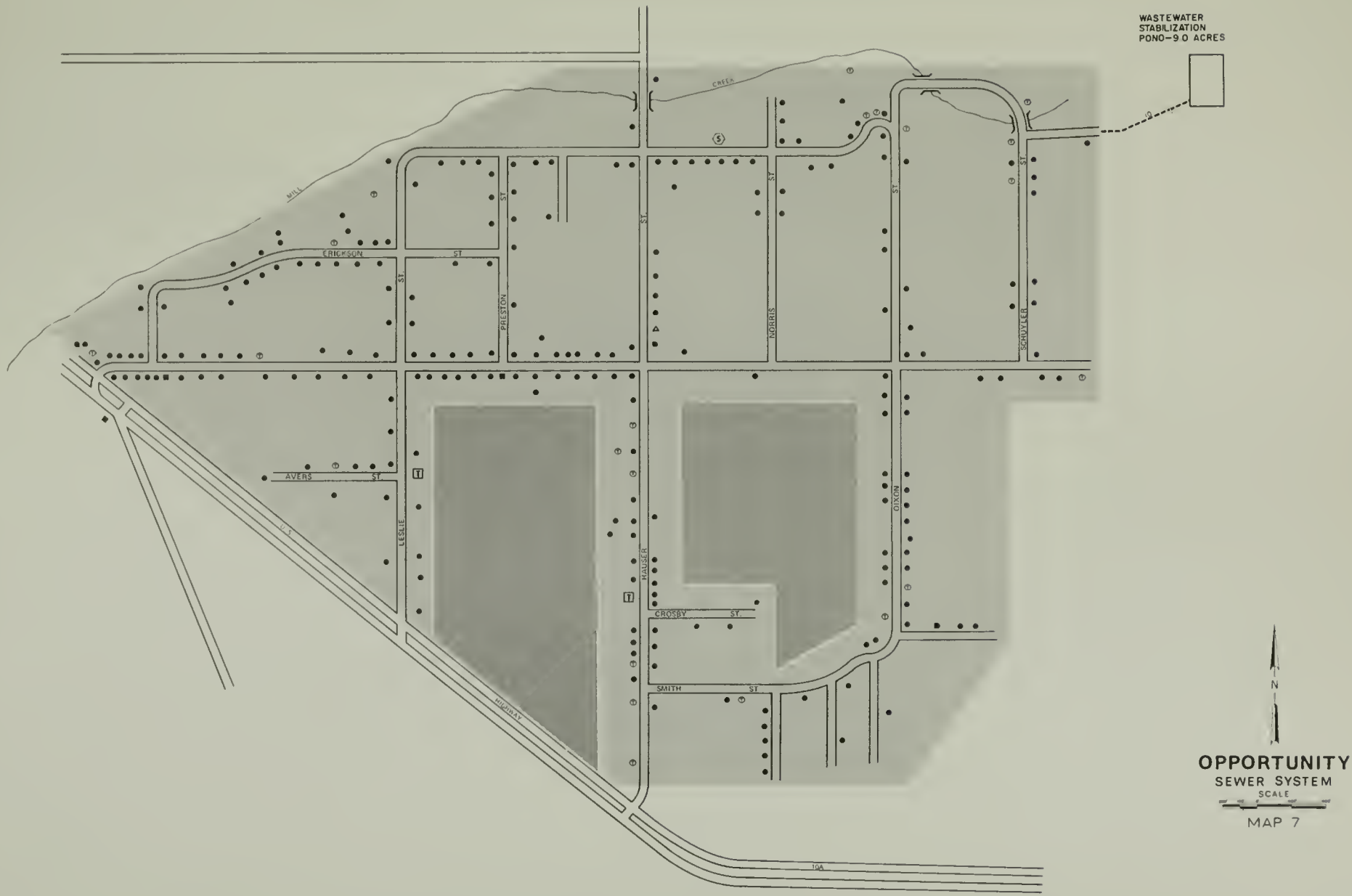



-N-

GEORGETOWN LAKE AREA
DEER LODGE & GRANITE COUNTIES

SCALE
1000 500 0 1000 2000 3000 4000

MAP 6


WASTEWATER
STABILIZATION
POND—9.0 ACRES
CREEK
MILL
ERICKSON
ST
PRESTON
NORRIS
SCHUYLER
AVERS
LESLIE
HAUSER
DIXON
CROSBY
SMITH
HIGHWAY
N
OPPORTUNITY
SEWER SYSTEM
SCALE
MAP 7

SILVER BOW COUNTY

MONTANA

SILVER BOW COUNTY

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# CONCLUSIONS, RECOMMENDATIONS, AND PRIORITIES

## Conclusions

The total population of Silver Bow County is expected to decline slightly until 1975 and then increase slowly throughout the rest of the planning period. Of the towns studied in the preparation of this report, however, only the community of Rocker, near the environs of Butte, shows an increase in growth during the planning period. All other communities show a decline in population as Butte and the immediate vicinity are expected to reflect the only growth in the county. Other than the large combined water and sewer system which serves Butte and Walkerville, the community of Ramsay has the only other complete central water and sewer system in Silver Bow County. This existing water and sewer system has been reviewed and improvements are proposed where necessary. The community of Melrose in southern Silver Bow County is of sufficient size to warrant the construction of central facilities and both water and sewer systems for this community are proposed and discussed in this report. The community of Rocker has an existing partial, central water and sewer system and recommendations for revising and updating these systems are included.

## Recommendations

This plan shows the various types of improvements which the communities should be considering during the planning period. Elaborate systems are not proposed but rather those facilities necessary to provide safe and adequate community systems. It is recommended that this general plan be adopted by the governing agencies of each community. A detailed approach, which must be undertaken to insure completion of the improvements in each community, cannot be covered in a report of this type. Community leaders, however, do have several courses of action which may be taken.

Most small communities do not have the means to plan and finance complete water and sewer systems. Therefore, to enable communities to acquire such facilities, five departments of the Federal Government have legislation authorizing loans or grants for construction of public works. These agencies are:

Farmers Home Administration
United States Department of Agriculture
P.O. Box 850
Bozeman, Montana 59715

Federal Water Quality Administration
United States Department of the Interior
% Montana State Department of Health
Helena, Montana 59601

Public Health Service
United States Department of Health, Education, and Welfare
Division of Indian Health
Billings, Montana 59101

Administration for Metropolitan Development
United States Department of Housing and Urban Development
Assistant Regional Administrator
Denver Regional Office
1050 South Broadway
Denver, Colorado 80209

Economic Development Administration
United States Department of Commerce
Montana Field Coordinator
207 Medical Arts Building
Butte, Montana 59701

The legislation is constantly changing; therefore, community leaders should investigate the various alternatives and determine which program and course of action would be most beneficial to them.

## Priorities

That a particular system requires immediate improvements and another system will be satisfactory for a definite period are difficult to establish. Several indicators for establishing priorities are available, however. The general health of the people is the prime consideration, and this can only be insured when safe water supplies are provided. Water supply in adequate quantities is another important factor. Waste water must be treated and disposed of by safe methods to minimize the problems of pollution and to protect public health. The total number of persons benefited by any improvement must also be considered. These basic criteria were used in establishing the following priority listing:

1. Melrose Sewer System. The reported problems of high ground-water table affecting sewage disposal and the evidence of some well contamination are of prime concern in this area. The number of persons who would benefit from this facility make the construction necessary and feasible.

2. Melrose Water System. Problems that have been encountered concerning contamination of shallow water wells and the potential health hazards stemming from this situation cause the construction of this water system to be of top priority.

3. Rocker Sewer System. Revision of the existing partial central sewer system to provide adequate collection and treatment will provide a better means of sewage disposal for the residents of Rocker and will also eliminate the current discharge of sewage effluent directly into Silver Bow Creek.

4. Rocker Water System. The existing partial central water system is old and in slightly deteriorated condition, and revision and updating of the system should be completed in the near future to avoid loss of service or potential health hazards. The number of persons who would benefit from this facility make this project feasible.

5. Ramsay Sewer System. The community of Ramsay is presently served by an adequate sewage collection system; however, planning for the construction of a sewage treatment facility for this system should begin at this time. A treatment facility coupled with the existing collection system will provide the community with an excellent means of sewage disposal and will eliminate the discharge of raw sewage effluent into the Silver Bow Creek drainage.

## THE LAND

### General Characteristics

Silver Bow County is located in the southwestern part of the State of Montana and is bounded by the counties of Deer Lodge, Jefferson, Madison, and Beaverhead. The county covers an area of 716 square miles.

As seen on Map 1, the topography of the area ranges from rolling forest covered mountains to flat plains and prairies. The elevation varies from about five thousand feet in the central portion of the county to nearly 9,500 feet above sea level at Mount Fleecer and other peaks that are part of the Continental Divide which extends through the northern part of the county.

Population and development have spread relatively evenly throughout the area, but the majority of people are located in the mining town of Butte. The county seat of Butte is the hub of mining, farming, livestock raising, and lumbering activities in the area and has

become the major shopping, educational, and industrial center for outlying towns and communities.

Transportation facilities in the county are provided by numerous federal, state, and county roads. Butte has a unique transportation characteristic in that it is the only city in Montana where both north to south and east to west interstate highways meet. Interstate 90 travels from Deer Lodge to Butte and then continues eastward, and Interstate 15 travels from Helena to Butte and then continues southward. Several state and county secondary roads serve the more outlying areas.

Rail transportation to the county is furnished by four railroads; Burlington-Northern; Chicago, Milwaukee, St. Paul, and Pacific; Union Pacific; and Butte, Anaconda, and Pacific. All of the lines run into Butte. The main line of the Burlington-Northern extends from Helena to Butte and then northward to Missoula. The Burlington-Northern provides two passenger trains, the Mainstreeter and the North Coast Limited, each way daily; the number of freight trains provided varies daily and depends on local needs in the area. The Chicago, Milwaukee, St. Paul, and Pacific, an electrically driven railroad, provides freight service only and parallels the route of the Burlington-Northern. The Union Pacific Railroad, offering both freight and passenger service, travels northward from Wyoming and, passing through Dillon, terminates at Butte. The Butte, Anaconda, and Pacific Railroad was originally built for and by the Anaconda Copper Company to transport ore from its Butte mines to the smelter at Anaconda and still only extends between these two towns; presently, however, the line also provides general freight service to the area.

Silver Bow County has a commercial airport located at Butte which provides aircraft servicing facilities and connections to nation wide airlines. The three paved runways of 6,857, 5,566, and 5,556 feet in length enable passengers and freight to be economically transported to and from the area with ease and comfort.

The county lies in the service area of the Butte Division of the Montana Power Company, and a major Montana Power Company hydroelectric generating station is located at Butte. Other major power companies that either serve parts of the county or have major transmission lines or substations in the area are the Bonneville Power Administration and the Chicago, Milwaukee, St. Paul, and Pacific Railroad. The original source of most of the power distributed by Montana Power in the area is Bonneville Power Administration facilities.

Since major power producing centers and relay stations are usually located at widely separated points and provide power service to large

areas, Map 2 shows the major power grid system for the entire State of Montana. Major gas transmission lines are also shown.

Two telephone companies provide service to the county. Mountain States Telephone Company provides most of the area with telephone service; however, the Southern Montana Telephone Company serves the town of Divide and its immediate environs and the southern portion of the county.

## Land Ownership and Use

As seen in Chart 1, there are three ownership categories in the county. Federal ownership is the largest and accounts for just more than half of the total. Lands under private ownership represent forty three percent of the county while the remaining three percent are under state control.

The land use pattern generally reflects the physical characteristics of the county. Both forest use and commercial use each account for a similar amount, each claiming not quite half of the land. Much of the commercial areas are taken up by mining operations and related activities. The remaining fifteen percent is used for agriculture.

## Natural Resources

The discovery of gold in 1864 brought recognition to Silver Bow County as an area rich in mineral resources. However, the gold boom soon died down because of a limited supply, and the emphasis shifted to silver. Copper was then discovered under the silver veins, and since that time the copper industry in the county has grown to make the major mine owner, the Anaconda Copper Company, the third largest producer of copper in the world. The Butte copper area, known as the "richest hill on Earth," is in the Summit Valley district in the heart of the southwestern lode country. This district produces most of Montana's copper and most of its other lode metals such as gold, silver, lead, and zinc. Since 1862 Montana has produced more than four billion dollars worth in metals, and copper represents well over half of this total.

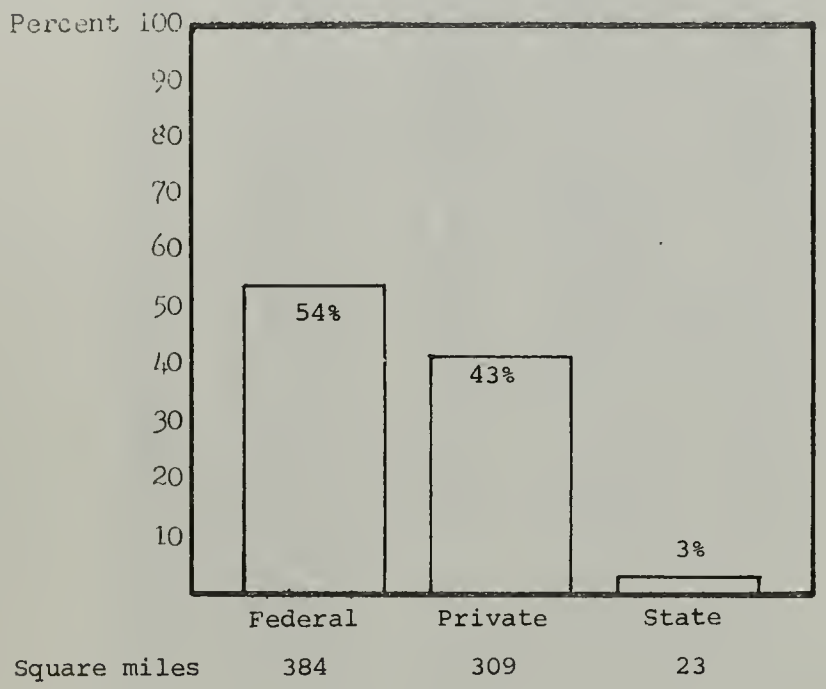
Manganese, phosphate rock, and sand and gravel are also found in the county. By the end of 1965 well over 300 million tons of material had been removed from the Butte pit. The work goes on around the clock, blasting, loading, and moving more than 150,000 tons of ore and waste every twenty four hours.

National forests account for almost half of Silver Bow County's land

CHART 1

Land Ownership

Silver Bow County



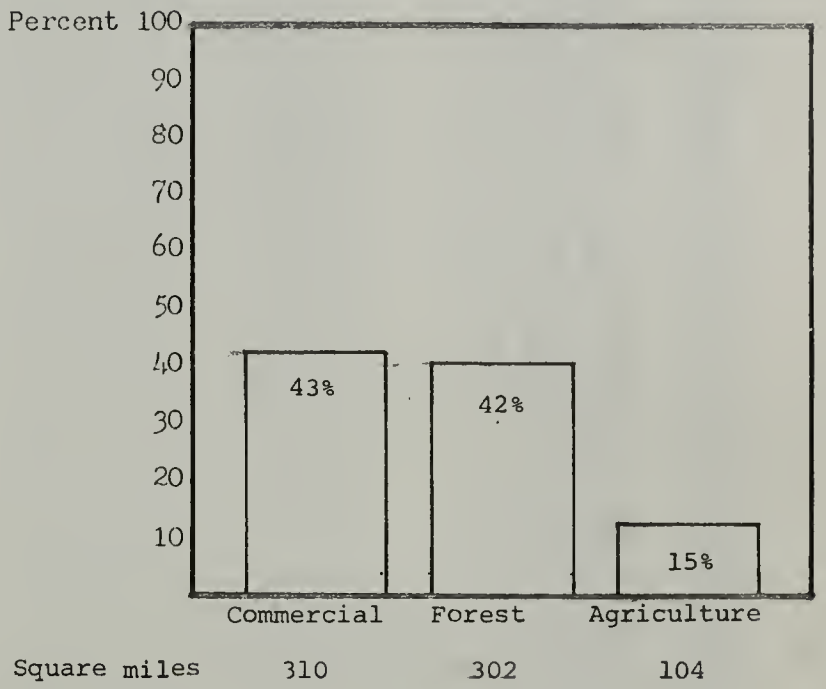

| Square miles | 384 | 309 | 23 |
|---|---|---|---|

Source: The Montana Almanac, 1959-60

CHART 2

Land Use

Silver Bow County




| Square miles | 310 | 302 | 104 |
|---|---|---|---|

area. However, only minor logging operations are in existence, thus utilizing only a small part of the forest crop. Carefully managed lumbering activities in these forests would add to the industrial and employment activity of the area.

Silver Bow County is noted for its recreational opportunities. The National Forests of Beaverhead and Deerlodge provide ample camping and relaxation areas. The Anaconda-Pintlar Wilderness Area offers a variety of outdoor recreation for the hiker and pack horse enthusiast. This tract of land is undeveloped national forest and has an outstanding scenic and wilderness appeal. The area is managed by the Forest Service and is kept in its natural, primitive state. Besides the wilderness area, fishing in the numerous lakes and streams challenge the angler sportsman. Big game hunting is plentiful in the forested mountain areas for such fine species as bear, deer, moose, and elk. A variety of game birds, geese, grouse, ducks, and pheasants, also abound. The recreation potential of the county will increase in importance as the population expands along with the increase in leisure time of America's working men and women.

## Soils

The soils of Silver Bow County are characteristic of those found in higher elevation areas. Rocky alpine soils that support very little vegetation are found on the highest points. The remainder of the county area is generally composed of grassland and forest area supporting soils. The soils in the valleys are of the rich agricultural type and support farming operations.

Soils will be covered in more detail later in this report.

## Water

An important factor in economy of the county and the area is the water supply. The forested slopes of the mountains are excellent watersheds and coupled with the small lakes and streams of the area provide an abundant water supply. The main drainage features of the county are the Clark Fork, which drains the major part of the northern county area, and the Big Hole River into which the southern county area drains.

Both surface and ground-water resources are covered in more detail later in this report.

## THE PEOPLE

### Population

For analytical and projective purposes, it is necessary to study the population history of Silver Bow County to find out what has happened and what is going to happen. Chart 3 graphically shows the growth of the county as compared with that for Montana and indicates the future growth for both.

The number of persons in the county has steadily declined since 1920. The decrease in population has been at a steady rate indicating a gradual lessening of local attraction power rather than a major occurrence causing people to move. The estimated 1970 population is about seventy percent of that in 1920.

Silver Bow County was classified as an urban area in 1960 but was not included within or adjacent to a Standard Metropolitan Statistical Area. Table 1 indicates the population changes that occurred between 1950 and 1970 in the urban, rural, farm, and rural non farm areas. Since 1950 the population in rural areas has decreased at a faster rate than in the urban places, and the farm population has also decreased at a greater rate than in the rural non farm areas. Because of the presence of the City of Butte, the county is clearly urban in character. In 1950 ninety percent of the population was urban. In 1960 this group represented ninety two percent of the total and increased to ninety three percent over the next ten year period. The farm population has remained about one percent of the total.

During the period from 1950 to 1960 the population of the county decreased by 1,968 persons. Chart 4 indicates that the decline is a result of a net migration loss of 8,138 persons and an excess of 6,170 births over deaths.

The 1950 to 1960 change in sex composition is shown in Chart 5. The ratio of males to females switched over the ten year period resulting in a slight preponderance of females over males.

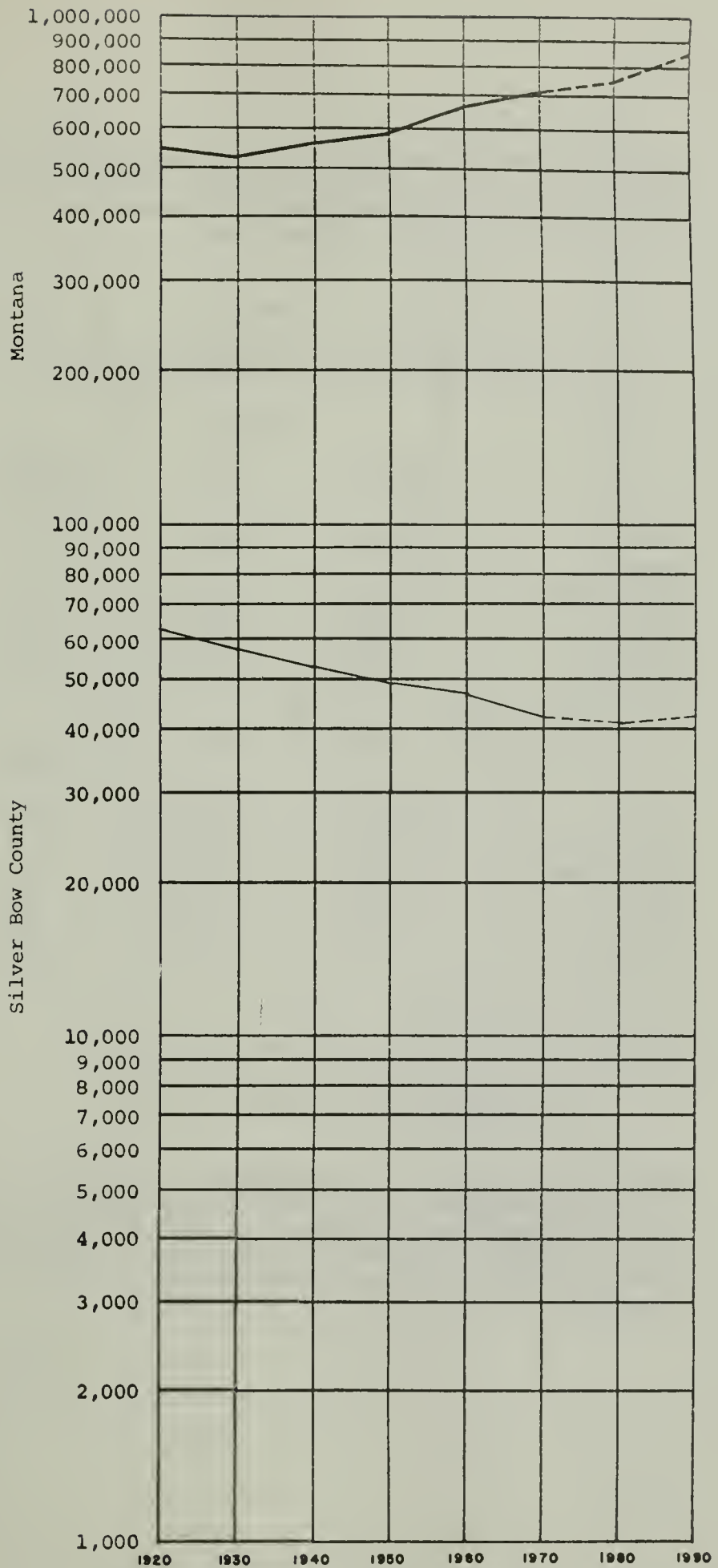
The age distribution by sex for 1950 and 1960 is shown in Table 2. As indicated the number of persons in the younger and older age groups increased while a substantial reduction occurred within the middle age groups.

A total of five communities were studied in Silver Bow County. The list includes the areas of Divide, Melrose, Ramsay, Rocker, and Silver Bow. The communities of Centerville, Donald, East Butte, Floral Park, Jamey, McGlone Heights, McQueen, Maiden Rock, Meaderville, Nissler,

CHART 3

COMPARATIVE
POPULATION
TRENDS

Silver Bow County
and Montana




Sources:

1. U.S. Census of Population
2. Intermountain Planners, Inc.

Silver Bow Park, Walkerville, and Williamsburg were also studied but were not included within this report either because of insufficient population and development or because they were located within or contiguous to the Butte urban area.

TABLE 1

Urban-Rural Population Changes for Silver Bow County

1950-1970

| | 1950 | 1960 | Changes Number | 1950-1960 Percent |
|---|---|---|---|---|
| Total | 48,422 | 46,454 | -1,968 | - 4.1 |
| Urban (Inc. Towns) | 43,537 | 42,950 | - 587 | - 1.3 |
| Rural | 4,885 | 3,504 | -1,381 | -28.3 |
| Farm | 567 | 283 | - 284 | -50.1 |
| Non Farm | 4,318 | 3,221 | -1,097 | -25.4 |

| | 1960 | 1970 | Changes Number | 1960-1970 Percent |
|---|---|---|---|---|
| Total | 46,454 | 42,000 | -4,454 | - 9.6 |
| Urban (Inc. Towns) | 42,950 | 39,200 | -3,750 | - 8.7 |
| Rural | 3,504 | 2,800 | - 704 | -20.1 |
| Farm | 283 | 150 | - 133 | -47.0 |
| Non Farm | 3,221 | 2,650 | - 571 | -17.7 |

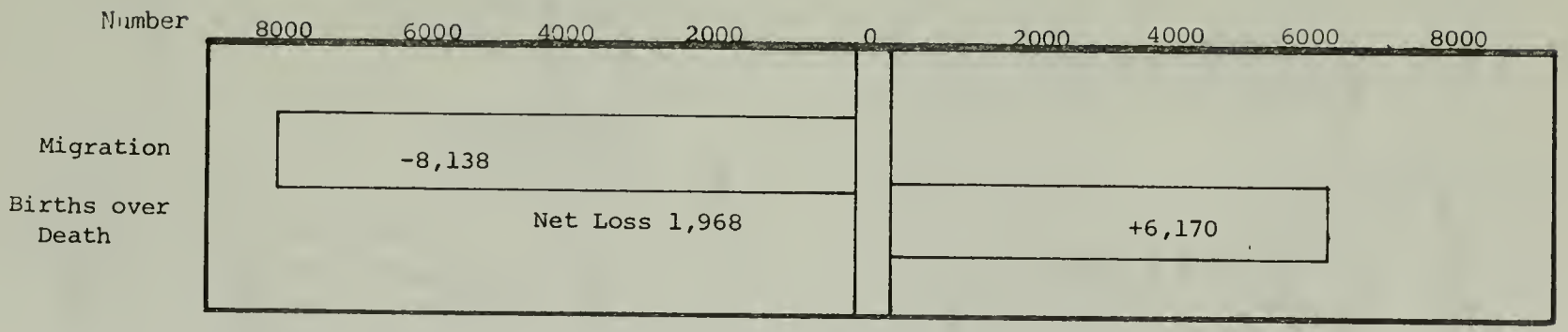
Sources: 1. U. S. Census of Population

2. Intermountain Planners, Inc.

Because of the time that has elapsed since the 1960 Census, current population estimates had to be derived from several sources in the field. Surveys and interviews were conducted to determine what now exists and what is expected in the future. Table 3 indicates the past population experience and the future projections for each community.

CHART 4

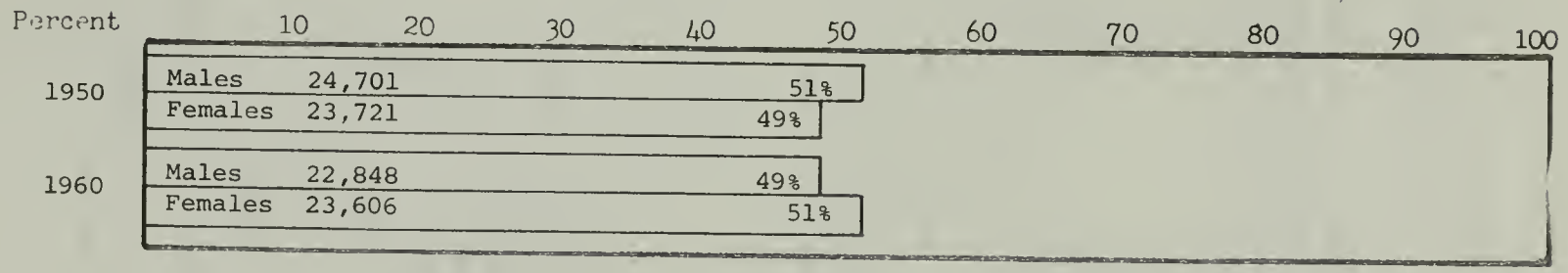
Population Change
Silver Bow County 1950 - 1960




Source: Net Migration of Population, 1950-1960 by Age, Sex, and Color, U. S. Department of Agriculture

CHART 5

Population by Sex
Silver Bow County 1950 - 1960




Source: U. S. Census of Population, 1950-1960

TABLE 2

Age & Sex Composition of Silver Bow County

| Age Group | 1950 Male | 1950 Female | 1960 Male | 1960 Female |
|---|---|---|---|---|
| Under 5 | 2,434 | 2,352 | 2,618 | 2,611 |
| 5-14 | 3,887 | 3,748 | 4,738 | 4,621 |
| 15-19 | 1,321 | 1,432 | 1,552 | 1,676 |
| 20-24 | 1,415 | 1,442 | 959 | 1,091 |
| 25-34 | 3,577 | 3,622 | 2,305 | 2,475 |
| 35-44 | 4,024 | 3,590 | 2,944 | 3,072 |
| 45-54 | 3,271 | 2,791 | 3,049 | 2,940 |
| 55-64 | 2,692 | 2,406 | 2,388 | 2,324 |
| 65-74 | 1,548 | 1,645 | 1,622 | 1,844 |
| 75 + | 532 | 693 | 673 | 952 |
| Total | 24,701 | 23,721 | 22,848 | 23,606 |

Source: U. S. Census of Population, 1950-1960

TABLE 3
Population Forecast for Communities and Towns

Silver Bow County

| | 1950 | 1960 | 1970 | 1975 | 1980 | 1990 |
|---|---|---|---|---|---|---|
| Divide | 39 | 145 | 40 | 35 | 30 | 20 |
| Melrose | 150 | 200 | 180 | 180 | 175 | 150 |
| Ramsay | NA* | 125 | 100 | 90 | 75 | 60 |
| Rocker | 110 | 50 | 110 | 110 | 120 | 120 |
| Silver Bow | NA* | 40 | 40 | 40 | 35 | 30 |

* Not available

Sources: 1. U. S. Census of Population, 1950-1960

2. Intermountain Planners, Inc.

As indicated, the number of persons in each community with the exception of Rocker will decrease over the next twenty years. In Rocker the projected growth of only ten persons will be accommodated within the existing community.

The population figures reflect only those factors and trends for which information is available. New technological advances, new industries, or other unforeseen events may alter these projections. If such an event occurs, the areas affected should be studied in light of the new conditions.

## Housing

In 1960 there were 18,222 housing units in Silver Bow County. Chart 6 indicates that almost nine out of every ten homes were classified as urban. This is mainly due to the concentration in the Butte urban area. Eleven percent of all dwelling units were in the rural non farm areas while farms represented only one percent. The median housing unit size was 4.2 rooms per unit, and the median household size per occupied unit was 3.0 persons. Of those units, more than half

HOUSING
Silver Bow County - 1960

Chart 6
Housing Classification

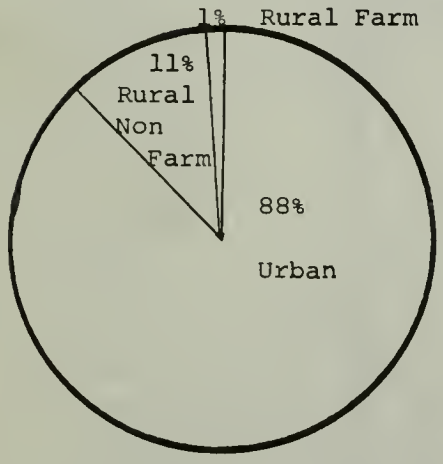



Chart 7
Housing Tenure

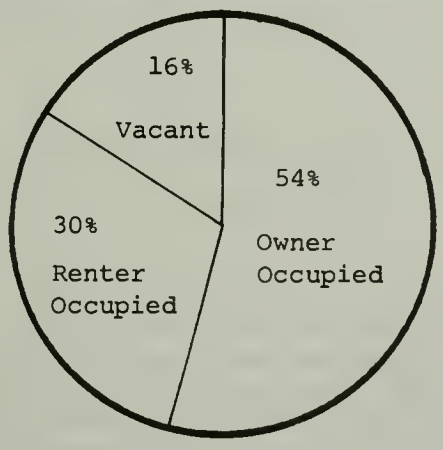
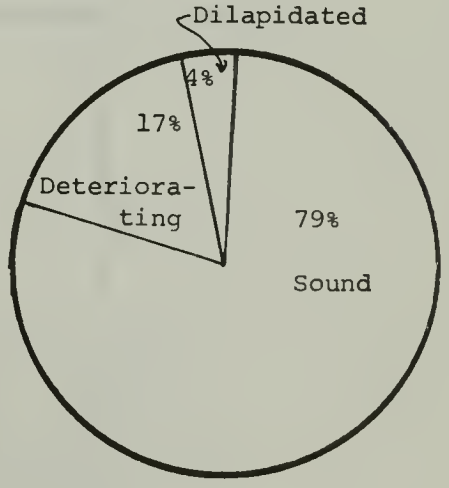


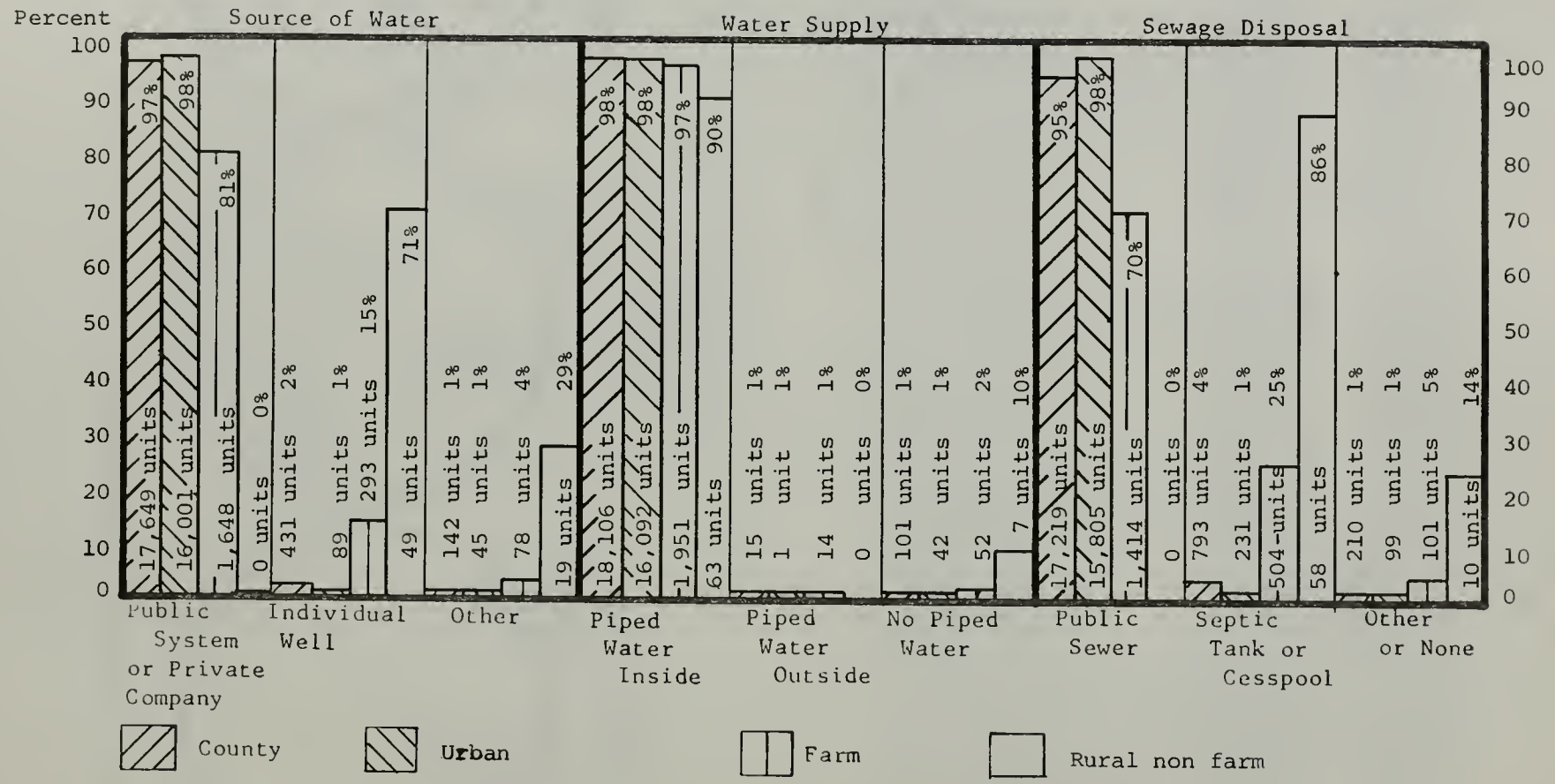

Chart 8
Housing Condition




Source: U. S. Census of Housing, 1960

CHART 9

Sewer and Water
Silver Bow County 1960




Source: U. S. Census of Housing, 1960

were owner occupied while almost one third were used for rental purposes. Chart 7 indicates that one home in six was vacant. The condition of housing in 1960 is reflected in Chart 8 which indicates that only four percent were in need of replacement while one home in six needed repair. The remainder were classified as sound.

Chart 9 reflects the 1960 status of housing units in terms of source of water, water supply, and method of sewage disposal. For geographical references, the data shows the status for Silver Bow County as a whole and for the homes in the urban, rural non farm, and farm areas.

In 1960 almost all homes were served by a public water system or by a private water company. Since the Butte area comprises almost all the homes in the county, the high percentage is understandable. Besides having the majority of the urban homes served by a water system, the majority of the rural non farm homes were also served. Farm homes generally relied on individual wells for water, although, almost twenty nine percent did resort to another source.

Almost all homes had piped water in 1960. Only one percent, which included ten percent of the farms, two percent of the rural non farm homes, and one percent of the urban homes, did not have any piped water at all.

As with a public water system, almost all homes were served by public sewer systems. Those served included ninety eight percent of the urban homes, seventy percent of the rural non farm homes, and none of the farms. Generally, farms relied on either septic tanks or cesspools as did one fourth of the rural non farm homes. Only one percent of all homes relied on some other source for sewage disposal.

Generally, the 1960 housing data indicates that water and sewer service was adequate. This is primarily because the majority of homes were located in the Butte area.

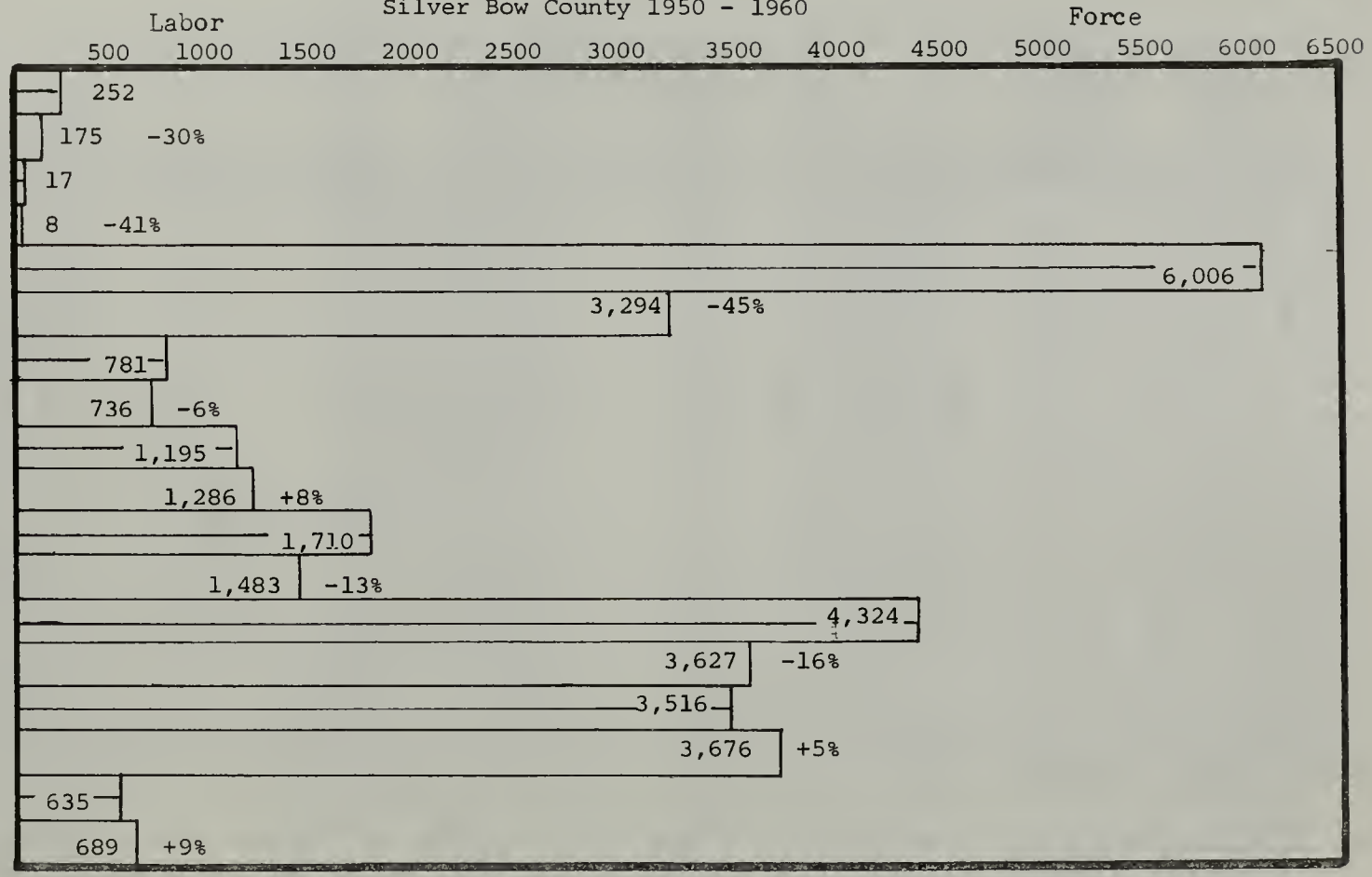
## THE ECONOMY

### Labor

In order to study the economy of an area, it is important to understand the characteristics of the labor force. This is necessary because of the producer and consumer roles each member of the labor force plays. The following economic analysis of Silver Bow County is concerned primarily with the total economic spectrum and how it may affect the future. Changing economic conditions can have either a good or a bad effect on an area in terms of population growth, ability to provide for public improvements, or in determining the general overall living environment.

CHART 10

Employment Change by Major Industry Group
Silver Bow County 1950 - 1960




1950 Total Employment 18,632*

1960 Total Employment 15,399*

*Includes Some Industries Not Reported

Source: U. S. Census of Population, 1950-1960

Employment dropped seventeen percent in the county between 1950 and 1960 as compared to a population decline of four percent. The decline in the labor force is contrasted with a six percent gain for Montana in the same period.

The past employment by major industry groups is shown in Chart 10. As indicated, total employment declined sharply as did the number in the labor force. The major portion of the decline occurred in mining while only manufacturing, government, and services and finance increased. During the ten year period women assumed a larger percent in the labor force, at a rate double that for the 1940 to 1950 period. Lower copper prices and the advent of automation caused population and employment decline. Open pit mining also affected the number of workers needed in the mining industry.

In 1960 the services and finance industry accounted for the largest number of employees, claiming only about fifty more than the trade group, and almost four hundred more than the mining group. The amount of employees in the services and finance, and the trade groups results from the regional role Butte plays. The Butte area serves as the primary shopping area for Beaverhead, Deer Lodge, Madison, Jefferson, and Silver Bow Counties.

The majority of the economic activities for the county are centered in Butte which, because of its size, has been excluded from the scope of this report. The economic forces within that city do affect the economy of the total county, however, and cannot be overlooked.

The percentages for employment by industry group, as shown in Table 4, give an insight into local employment characteristics. The table shows the relative weight of each industry group in the county and offers a comparison with that existing in 1960 for the State of Montana and the United States.

The trade and the services and finance groups attracted almost half of the total labor force. The trade industry had only slightly less employees than did services and finance.

Copper extraction in Butte was responsible for the large percentage of persons in the mining group. The rate for the group was about seven times greater than that for the state and twenty two times that for the nation.

Between 1960 and 1970 the population of Silver Bow County dropped approximately ten percent. The decline had a direct affect on the labor force in the county. Labor statistics for 1969, as provided by the Employment Security Commission of Montana, indicate a continuing decline similar to that noted between 1950 and 1960. Mining, for example, declined in total numbers almost twenty two percent.

TABLE 4

Percent of Total Employment by Industry Groups

Silver Bow County, Montana and United States

1960

| | Silver Bow County | Montana | United States |
|---|---|---|---|
| Agriculture | 1 | 17 | 11 |
| Forestry and Fisheries | 1 | 1 | 1 |
| Mining | 22 | 3 | 1 |
| Construction | 5 | 7 | 5 |
| Manufacturing | 8 | 10 | 27 |
| Transportation and Utilities | 10 | 9 | 7 |
| Trade | 24 | 21 | 19 |
| Service and Finance | 24 | 26 | 16 |
| Government | 5 | 6 | 13 |
| Total | 100 | 100 | 100 |

Source: U. S. Census of Population, 1960

The economy of Silver Bow County will continue to rely on the mining industry. To a lesser extent, the regional composition of the marketing area will serve to diversify the economic base.

## Agriculture

A farm is defined by the United States Census as a place having at least ten acres of land devoted to agriculture and selling at least fifty dollars worth of agricultural products annually. According to Chart 11, there were 137 farms in Silver Bow County in the above category in 1964, or thirteen percent more than there were in 1959.

The 1964 classification of farms by type was as follows:

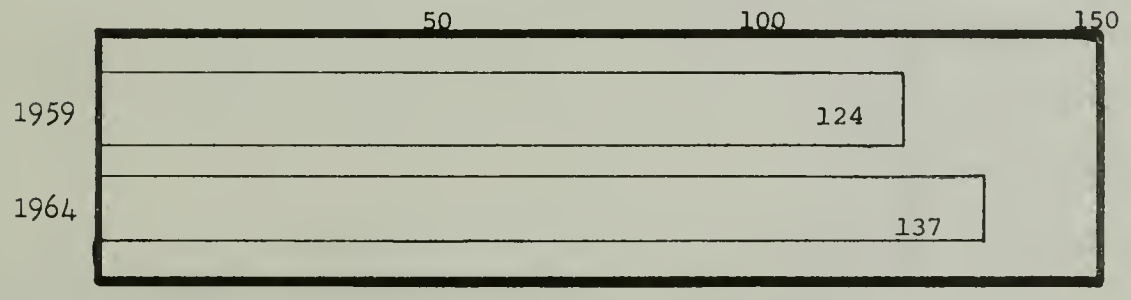
| | |
|---|---|
| Poultry farms | 2 |
| Dairy farms | 3 |
| Livestock farms other than poultry and dairy | 52 |
| General farms | 2 |
| Miscellaneous and unclassified | 78 |
| Total | 137 |

Of the total number of farms, fifty two were classified as part time and seventeen were classified as being operated by semi retired persons.

The average size farm in 1964 was 935 acres, approximately ten percent smaller than that recorded in 1959. As noted, the distinction of farm types was not as stratified as in other Montana counties. For example, fifty seven percent of all farms were listed as miscellaneous and

CHART 11

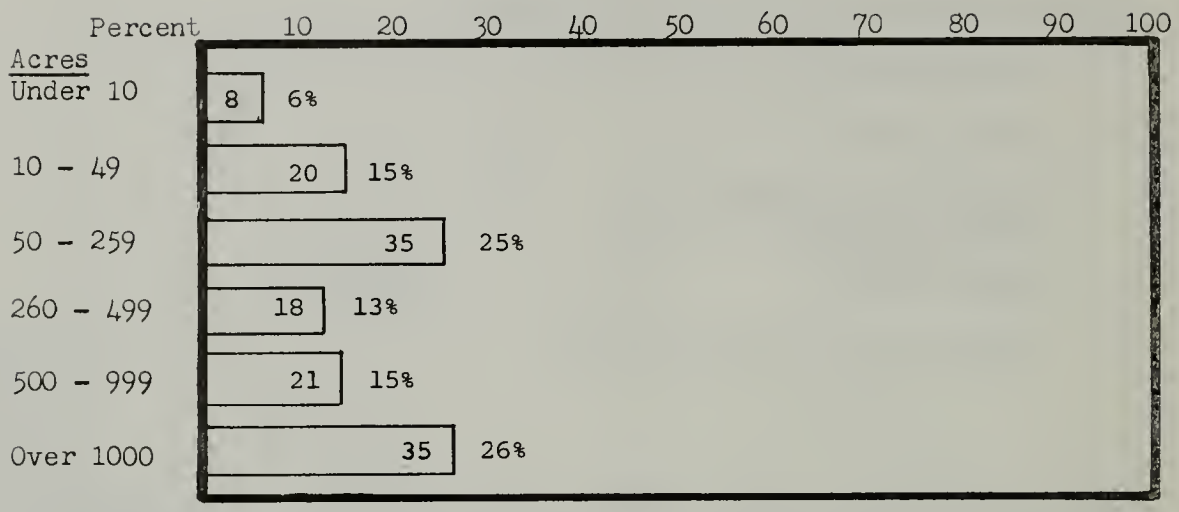
Number of Farms
Silver Bow County 1959 - 1964




Source: U. S. Census of Agriculture, 1964

CHART 12

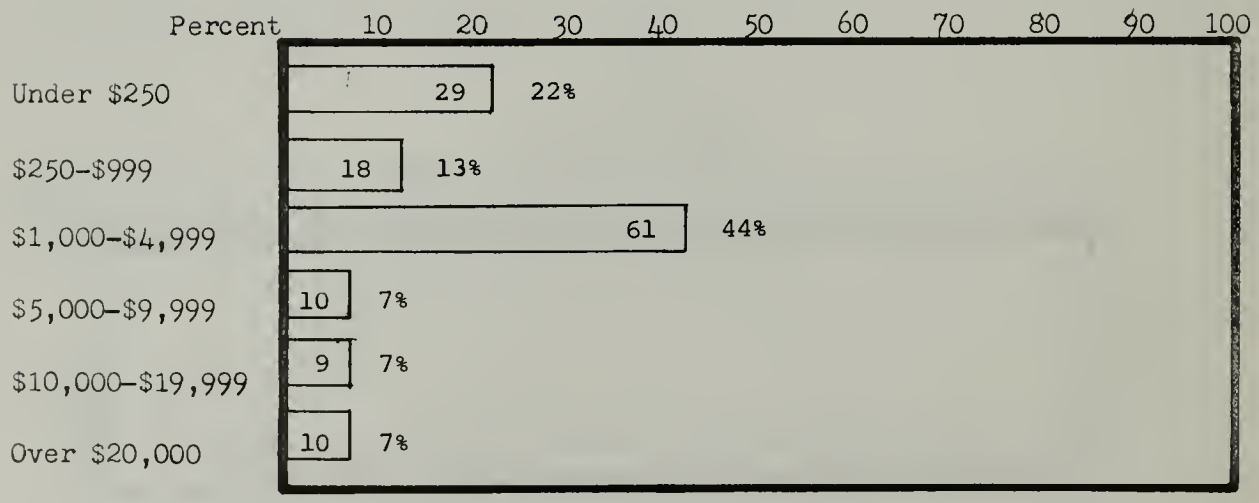
Farms by Size
Silver Bow County 1964




Source: U. S. Census of Agriculture, 1964

CHART 13

Number of Farms by Value of Farm Products Sold
Silver Bow County 1964




Source: U. S. Census of Agriculture, 1964

unclassified. Chart 12 indicates that only one farm in four was more than one thousand acres in size while fifty nine percent were under five hundred acres.

The value of products sold by the number of farms indicates the intensity of the agricultural industry. Only one farm in seven reported sales of over $10,000 while one in fourteen received more than $20,000 for products sold. At the other extreme, almost four fifths of all farms had gross sales under $5,000, thus reflecting the impact of the thirty eight percent part time farms.

Cash receipts data for the county from 1964 to 1967 is as follows:

| Year | Livestock | Crops | Total |
|---|---|---|---|
| 1964 | $438,900 | $142,400 | $581,300 |
| 1965 | $528,900 | $152,900 | $681,800 |
| 1966 | $641,100 | $157,100 | $798,200 |
| 1967 | $538,100 | $165,900 | $704,000 |

During the reporting period only one county had less agricultural sales than did Silver Bow County. Because of adverse terrain, the county is not particularly well suited for farming. Livestock raising is more adapted to the land, and the cash receipts data indicates this.

In the future agriculture will remain much the same as in the past. There will be, however, more farms of smaller sizes as farm units become uneconomical to operate.

## THE GOVERNMENT

Before any meaningful consideration can be given to major capital improvement projects, it is necessary to study the governmental organizations in Silver Bow County and to analyze their economic structure. At present there is only the county government involved within the scope of this water and sewer study; the City of Butte and its environs has been excluded due to the size of the population. A Board of County Commissioners presided over by a chairman governs the county.

In financing capital improvement projects, the incorporated municipalities have power to bond and raise the necessary moneys for funding projects. The unincorporated small towns do not have similar power and, therefore, must rely on revenues of the county government.

In fiscal year 1969 the county revenue and expenditure figures were $19,315,452.75 and $19,573,269.03 respectively. The assessed valuation of county property was $138,667,450.00.

There are several methods presently available to communities for financing water and sewer systems. Incorporated cities and towns may use municipal bonds, municipal revenue bonds, and Special Improvement District bonds. Unincorporated towns, on the other hand, may use Rural Special Improvement District bonds and County Water and Sewer District bonds. Incorporated cities and towns and adjacent unincorporated areas may also use Metropolitan Sewer District bonds.

## THE WATER RESOURCES

### General

The water resources of any area are one of its most important assets. Montana is fortunate in that water is in abundant supply over much of the state. This is especially true in the mountain areas and along the major drainages. Water is essential for many human needs with individual consumption and sanitation being foremost. Industrial and agricultural uses of water are perhaps next most important. The recreational use of water has also become a significant factor in modern day living.

In his use of this resource, man in the past has polluted much of the available fresh water and degraded it to the point where it is unfit for many or all uses. Careful planning for the efficient use of water resources can avert inconveniences caused by pollution.

Water resources, therefore, are an important consideration in the comprehensive planning for community water and sewer systems. In the following portion of this report the existing water resources of the planning area will be briefly reviewed. The discussion will be specifically concerned with the occurrence and availability of both surface and ground water. Also important, and included in Appendix I, are the specific laws and policies of the State of Montana concerning surface and ground-water resources. "Water Quality Criteria," "Water Use Classifications," and "Policy Statements" adopted by the State Department of Health are discussed in detail. Table A in Appendix I outlines present day water quality standards as set forth by the United States Health Service.

## Surface-Water Resources

Silver Bow County has an extensive drainage system which has primary characteristics of mountainous topography. The entire county is surrounded by mountainous terrain with the Continental Divide mountains predominating. The Continental Divide forms the eastern boundary of Silver Bow County to a point southeast of Butte where it turns in a westerly direction and crosses the central portion of the county before entering Deer Lodge County south of Anaconda. The wide variations in elevations add to the complex surface drainage system. Elevations in excess of ten thousand feet occur in the Highland Mountains in southeastern Silver Bow County; whereas, an elevation just exceeding four thousand feet above sea level occurs along the Jefferson River less than fifteen miles east of the Highland Mountains.

The Big Hole River is the major drainage feature of Silver Bow County. The river forms the border of the county from the extreme southwestern corner, southeast to Divide, and then south to Melrose where it becomes the county line between Beaverhead and Madison Counties. The Big Hole River joins the Beaverhead River and the Ruby River north of Twin Bridges, thus forming the Jefferson River which is an important tributary of the Missouri River. The Big Hole River is the recipient of all the drainage south of the Continental Divide in southern Silver Bow County. The remainder of the drainage from east and northeast of the Continental Divide in the county flows directly into the Jefferson River or into the Boulder River drainage which is part of the overall Jefferson River drainage network. Drainage north and west of the Continental Divide in the county is collected in a network of streams which flow into Silver Bow Creek. Silver Bow Creek flows north to Deer Lodge County west of Ramsay where it joins the other drainages to form the headwaters of the Clark Fork River. The Clark Fork is an important tributary of the upper Columbia River.

The above mentioned streams and their tributaries provide a yearlong source of water for irrigation, livestock, and domestic needs. Some of these streams have gaging stations installed by the United States Geological Survey where flow measurements are taken and recorded at regular intervals. Table 5 includes available data on the drainage area and discharge for the gaging station located on the Big Hole River near Melrose.

Many small reservoirs provide water storage for various uses in the county. The Montana Water Resources Board has compiled a list of data pertaining to all those reservoirs in the state of Montana which store fifty acre feet or more of water. This published list also contains available information on privately owned small dams and reservoirs. Some information on the location of these facilities is contained in the "Water Resources Survey" published by the Montana

TABLE 5

Stream Gaging Station

| Stream | Gaging Sta. Location | Drainage Area (sq mi) | See Note | Discharge (cfs) Max. | Date | Min. | Date | Average | Years Averaged | Runoff-)1000 Acre-Ft) Max. | Date | Min. | Date |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Big Hole River | Near Melrose | 2,470 | 1 | 23,000 | 6/14/27 | 49 | 8/17/31 | 1,124 | 22 | * | * | * | * |
| 2. German Gulch | Near Ramsay | New Station - No Records Available at time of water resources survey | | | | | | | | | | | |

Source: "Water Resources Survey" Silver Bow County, Montana
Montana Water Resources Board, Helena, Montana, 1955

Note: 1. Irrigation diversions occur above this station

* Not Recorded

Water Resources Board in June, 1955.

The climate varies considerably from one area to another because of the wide range of topographic conditions. The effect that the topography has on the climate is very important to the water resources of the county. Prevailing west to southwest winds flowing across the high mountains provide the highest annual precipitation values, whereas the valley portions of the county experience much lower values.

In general, precipitation occurs as steady rains in the spring months of April through June, intermittent showers throughout the summer and early fall months, and as snowfall during the winter months. The majority of the precipitation in the lower valleys and agricultural areas occurs during the growing season. Precipitation in the mountainous areas is fairly steady throughout the year. Much of the precipitation during the winter months occurs as snowfall, and the resulting heavy snowpack produced in the high mountains each year contributes significantly to the water resources. Snow begins to accumulate in November in the higher mountain valleys and continues to build up until late March or early April. Portions of the high mountain snowpack in Silver Bow County and in other adjacent drainage areas remain until the warm temperatures of late July and August begin to melt them. The runoff from the snowpack at this time of the year coincides with the period of maximum demand for water in the valleys below.

The use of surface water is widespread for domestic, agricultural, and recreational purposes. The town of Butte uses surface water from the Big Hole River, Basin Creek, and Moulton Creek for its municipal supply. (See Table 6 for chemical analysis of these water supplies.) The 1964 Census of Agriculture indicates that at that time 6,907 acres were being irrigated in Silver Bow County. Indications are that a potential exists for the irrigation of additional acreage. A final but important use of surface water is for recreational purposes. The mountain lakes and streams in the county are ideal habitat for fish and waterfowl and draw many sportsmen to the area each year.

## Water Use Classification

The Water Pollution Control Council has classified the streams and drainages in Montana according to the water use classification definitions shown in Appendix I. The streams and drainages of Silver Bow County and surrounding areas are classified as follows:

| | |
|---|---|
| Warm Springs Drainage to Myers Dam | A-Open-$D_1$ |
| Remainder of Warm Springs Drainage | B-$D_1$ |

| | |
|---|---|
| Silver Bow Creek (mainstem) from the confluence of Yankee Doodle and Blacktail Deer Creeks to Warm Springs Creek | For industrial waste use |
| Yankee Doodle Creek Drainage to and including the Butte water supply reservoir | A-Closed |
| Remainder of Yankee Doodle Drainage | $B\text{-}D_1$ |
| Blacktail Deer Creek Drainage except portion of Basin Creek listed below: | $B\text{-}D_1$ |
| Basin Creek Drainage to and including the Butte water supply reservoir | A-Closed |
| Remainder of Basin Creek Drainage | $B\text{-}D_1$ |
| All other tributaries to Silver Bow Creek from the confluence of Yankee Doodle and Blacktail Deer Creeks to Warm Springs Creek | $B\text{-}D_1$ |
| Clark Fork River (mainstem) from Warm Springs Creek to the Little Blackfoot River | $C\text{-}D_2$ |
| Big Hole River Drainage (tributary to the Jefferson tributary to the Missouri River) above Divide | A-Open-$D_1$ |
| Remainder of the Big Hole Drainage | $B\text{-}D_1$ |

Ground-Water Resources

The ground-water resources of Silver Bow County are used for domestic and stock purposes. As of January 1970, 316 well and 249 spring appropriations were recorded with the Montana Bureau of Mines and Geology. A total of 190 wells are used for domestic purposes, twenty four for stock, eleven for irrigation, seventeen for industrial use, fifty six for a combination domestic and stock purposes, and eighteen for various other purposes. A total of 130 springs are used for stock purposes, thirty one for domestic, twenty three for irrigation, and fifty two for a combination stock and domestic purpose; the use of seven springs is unreported. The majority of the ground-water appropriations are in the Butte Valley, Browns Gulch, and along the Big Hole

River from Divide to Melrose. Many people in communities in the county use private wells as a source of domestic water. The community of Ramsay uses two wells as a source of municipal water. (See Table 6 for a chemical analysis of this water supply.)

TABLE 6

Chemical Analysis of Municipal Water Supplies
(All Figures in Milligrams per Liter)*

| City or Town | Butte | Butte | Butte | Ramsay |
|---|---|---|---|---|
| Source | Big Hole River | Basin Creek | Moulton Creek | Wells |
| Date | 5/68 | 6/67 | 6/67 | 3/69 |
| Total Solids | 160 | 104 | 90 | 352 |
| Hardness | 60 | 46 | 36 | 230 |
| Ca | 24 | 15 | 13 | 64 |
| Mg | 0 | 2 | 1 | 17 |
| Na+K | 30 | 14 | 16 | 33 |
| $CO_3$ | 0 | 0 | 0 | 0 |
| $HCO_3$ | 55 | 61 | 46 | 231 |
| $SO_4$ | 62 | 23 | 27 | 69 |
| Cl | 9 | 2 | 4 | 23 |
| $NO_3$ | 2 | 0.0 | 0.0 | 3.4 |
| F | 0.08 | 0.2 | 0.2 | 0.22 |
| Fe | 0.1 | 0.00 | 0.20 | 0.0 |
| As | 0.0 | 0.00 | 0.00 | - |
| Pb | 0.0 | 0.00 | 0.00 | - |
| Cu | 0.0 | 0.00 | 0.00 | - |
| Zn | 0.2 | - | - | - |

* See Appendix I, Table A, for accepted water quality standards

Source: State Department of Health, Helena, Montana

There have been numerous geological studies completed in the county, most of which have been associated with the mining industry. Three ground-water studies that cover parts of Silver Bow County have been completed. These are (1) Meinzer, O. E., 1914, The water resources of Butte, Montana: U. S. G. S. Water-Supply Paper 345-G; (2) Konizeski, R. L., and others, 1962, Preliminary report on the geology and ground-water resources of the southern part of the Deer Lodge Valley, Montana:

Montana Bureau of Mines and Geology Bull. 31; and (3) Botz, M. K., 1969, Hydrogeology of the Upper Silver Bow Creek drainage area, Montana: Montana Bureau of Mines and Geology Bull. 75.

The occurrence, availability, and quality of ground water in Silver Bow County is closely related to geological conditions in the county. A wide variety of geological materials are present in the county. With respect to ground water, geological materials can be grouped as Recent alluvium, Tertiary sedimentary deposits, Tertiary volcanics, granitic rocks of the Boulder batholith, and sedimentary and metamorphic rocks of Precambrian through Cretaceous age. Most of the county is mountainous, and most ground-water development has been limited to the broad intermountain valleys.

Sedimentary and metamorphic rocks ranging in age from Precambrian (more than 600 million years old) to Cretaceous (65 to 135 million years old) are present in the Highland Mountains south of Butte and in the Mount Fleecer area northwest of Divide. These rocks have a wide range of lithologies, including limestone, shale, quartzite, gneiss, and schist. There has been little ground-water development in these areas. However, these rocks contain ground water in sandy and fractured zones and would probably yield small to moderate amounts of water to wells. The limestones often give rise to springs and frequently contain porous zones that will yield small to large amounts of water.

Granitic rocks of the Boulder batholith are present in the Butte area and throughout most of the central part of the county. These rocks are predominantly quartz monzonite in composition, are commonly fractured, and are cut by numerous dikes and sheets of alaskite, aplite, and pegmatite. A few wells have been drilled into the granitic rocks, and generally the rocks will yield small to moderate quantities of good quality water. South of Butte, granitic rocks supply water to a number of private homes.

Volcanic rocks of Tertiary age (one to 65 million years old) are present over a large area in the northwestern part of the county and in the Mount Fleecer area. These rocks consist predominantly of welded tuff, rhyolite, and other volcanic flow rocks and are part of the Lowland Creek volcanics. These rocks contain some ground water but except for springs have not been used as a source of water.

Sediments of Tertiary age are present in the broad valley between Divide and Silverbow. These are composed of fine gravel, sand, silt, and clay and contain some ash beds. The thickness of the sediments is poorly known, but they are probably several hundred feet to as much as a thousand feet thick. Tertiary sediments contain ground water, but few wells have been drilled into them. Near Silverbow, several wells

in the Tertiary sediments yield as much as four hundred gallons per minute (gpm) of good quality water. In most areas, however, yields are less than fifty gpm.

By far the most widely used source of ground water in the county is Recent alluvial deposits in the Butte Valley and along major streams in the area. The alluvium is unconsolidated layers and lenses composed of mixtures of sand, silt, clay, and fine gravel. Wells in the Butte Valley generally yield five to seventy five gpm from depths ranging from twenty five to 150 feet. In some parts of the valley particularly along the lower Blacktail Creek, Browns Gulch, and Silver Bow Creek, the alluvium will yield several hundred gpm to properly constructed wells.

The thickness of alluvium in the Butte Valley is poorly known. Seismic and gravity work has indicated a depth of seven hundred to eight hundred feet in the center of the valley. The alluvium is recharged by precipitation and by seepage from streams. Ground water moves northward in the Butte Valley until at the junction of Blacktail and Silver Bow Creeks the direction of movement is westward. Quality of ground water in the alluvium is very good. The water is of the calcium bicarbonate type and contains ten to 250 parts per million total dissolved solids.

In summary, the ground-water resources of Silver Bow County are used for domestic and stock purposes. Numerous relatively shallow wells obtain water from alluvial material in the valleys. Alluvium in the Butte Valley and in the valley extending from Divide to Rocker is the most widespread source of ground water in the county. The water generally is of good quality. There will be some additional ground-water development for domestic and stock purposes and to a lesser extent for irrigation and industrial purposes. Ground-water resources in the Butte Valley have been studied in detail, but the remainder of the county has not been investigated.

Sources: 1. M. K. Botz, Montana Bureau of Mines and Geology, Butte, Montana, 1970

2. "Water Resources Survey" Silver Bow County, Montana, Montana Water Resources Board, Helena, Montana, June, 1955

# THE SOILS

## General

General descriptions of soils in specific areas are useful in predicting the potential problems which might be encountered during private and public works construction. Silver Bow County has an interesting and complicated geologic history which has greatly influenced the soil structure of the area. The dominating physiographic features are the stream valleys bordered by high mountain ranges.

Extensive drainage throughout the area over periods of time has resulted in erosion of the mountainous terrain and the subsequent filling of the stream valleys and drainage basins with alluvium. The largest and most significant alluvial valley or basin in Silver Bow County is the Upper Silver Bow Basin in which the city of Butte is located. The soils of Silver Bow County are made up of the alterations of the alluvium and other geologic parent materials of the nearby mountains due to conditions of climate, topography, and living organisms.

## Soil Map

The Soil Conservation Service of the United States Department of Agriculture currently has a program under way to produce general soil maps for each county in Montana. At this time the detailed soil study of Silver Bow County has not progressed to the point where a general soil map for the entire county can be produced. The Soil Conservation Service has, however, recently completed a comprehensive study of the soils in the area of Butte, and has published a report of the study entitled "Soil Survey and Interpretations for Resource Planning and Urban Development." The study and report were done in cooperation with the Butte-Silver Bow County City-County Planning Board, and it contains valuable information concerning the types of soils that can be encountered during the planning and construction of private and public facilities in Butte and the immediately adjacent area. As detailed or general soil information for the entire Silver Bow County is not available at this time, information from the Butte soil survey is included in this report to provide a general idea of the soil conditions which exist in the northeastern portion of the county. General soil maps have been completed and are available for the adjacent counties of Deer Lodge, Beaverhead, Madison, and Jefferson. General soil information for the communities west of Butte along Silver Bow Creek and south of Butte along the Big Hole River can be obtained by referring to the adjacent county general soil maps. It is

recommended, however, that all available soil information be reviewed and that the services of the Soil Conservation Service office in Whitehall be utilized for the planning and construction of projects in specific areas of Silver Bow County.

As part of the soil survey for the Butte-Walkerville planning area, a detailed soil map was prepared. From the detailed map, the Soil Conservation Service compiled separate maps of the planning area which depict soil limitations or suitabilities for four different categories. These categories are: soil limitations for foundations for low buildings with basements, soil limitations for lawns and landscaping, soil suitability as a source of top soil, and soil limitations for septic tank filter fields. Two of these categories are pertinent to this Comprehensive Area-Wide Water and Sewer Plan, and they are shown in this report as follows: Map 4, soil limitations for foundations for low buildings with basements, and Map 5, soil limitations for septic tank filter fields. The soil interpretations shown on these maps are based on evaluations of the material to a depth of five feet. Soils rated as slight are relatively free of limitations or have limitations that are easily overcome. Soils rated as moderate have limitations that need to be recognized but can be overcome with good management and careful design. A severe rating indicates the limitations are severe enough to make use questionable. A severe rating does not mean that the soil cannot be used for a specific use, but it does mean that careful planning and design are needed; the possibility exists that the limitations may not be economically feasible to correct.

The soil interpretations for foundations and septic tank filter fields were based on a number of basic conditions. As stated in the soil survey publication, foundations for low buildings with basements are affected by soil properties and other related factors such as susceptibility to frost action, soil texture and density of the sub soil and sub stratum, flooding or ponding hazards, seasonal high water table, slopes as related to cuts and fills, depth to bedrock, and differential settling of moved material. This soil interpretation does not take into consideration the use of on site sewage disposal systems. Septic tank filter fields, on the other hand, are influenced by the ease of downward movement of effluent through the soil. Soil properties and other related factors are seasonal high water table, flooding hazard, slope, depth to bedrock, permeability rate, and ground-water contamination. The soil survey publication includes detailed information on soil limitations in tabular form for all of the soils contained on the detailed soil map. It is recommended that this report and map be reviewed during the planning of any public works project. The report is available from the Soil Conservation Service office in Whitehall, Montana.

Detailed descriptions of the soils in the Butte area are also included in the soil survey publication. These soils fall under seven separate categories which in turn are described as twenty seven different combinations. To provide general information of the types of soil encountered in the Butte area, descriptions of the seven largest categories or soil series are included as follows:

1. Slocum Series. The Slocum soils are on bottom lands and floodplains of perennial streams in the vicinity of Butte. These soils comprise about four percent of the area. They developed in alluvium from weathered igneous material. Elevation ranges from five thousand to seven thousand feet, and annual precipitation is twelve to fifteen inches.

These somewhat poorly drained, dark colored soils are noncalcareous throughout and have a moderately thick loam surface layer and stratified loam subsoil. The subsoil is underlain by sand and gravels at depths of thirty to sixty inches or more. Organic matter content is high, and permeability is moderate. Water table is seasonally within forty inches of the soil surface.

2. Philipsburg Series. The Philipsburg soils are most extensive on the upland fans and terraces southwest and west of Butte and comprise about eight percent of the area. They developed in calcareous loamy materials. Elevations range from five thousand to six thousand feet. Annual precipitation is twelve to fifteen inches.

These are well drained, dark colored soils. They have a thin loam surface layer and a moderately thick, sandy clay loam subsoil. The subsoil is underlain by calcareous, stratified loam to depths of sixty inches.

Natural fertility and organic matter content are low. Permeability is moderate, and available water holding capacity is high.

3. Basin Creek Series. The Basin Creek soils are most extensive in the valley south of Butte and comprise about twenty four percent of the area. They developed from granitic material on alluvial fans and terraces. Elevation ranges from five thousand to six thousand feet. Annual precipitation is twelve to fourteen inches.

These excessively drained dark colored soils are noncalcareous throughout. They have a thin, gravelly loam surface layer and a sandy clay loam subsoil. The subsoil is underlain by loose coarse sand and fine gravel at depths between ten and twenty inches. The coarse sand and fine gravel extends to depths of sixty inches or more.

Natural fertility and organic matter content are low. Permeability is

rapid and available water holding capacity is low.

4. Kenspur Series. The Kenspur soils are most extensive south and east of Butte and comprise about three percent of the area. They developed from granitic material on outwash fans, foot slopes, and in swales. Elevation ranges from five thousand to six thousand feet, and annual precipitation is twelve to fourteen inches.

These are moderately well to well drained dark colored soils. They have a moderately thick, loamy surface layer and a stratified subsoil of gravelly loam, sandy loam or coarse loamy sand. The subsoil is underlain by loose sand and gravel at depths of forty to sixty inches.

Natural fertility and organic matter content are high, and permeability and water holding capacity are moderate.

5. Lucky Series. The Lucky soils are common in most of the upland positions and comprise about fifteen percent of the area. They developed from granitic material on the uplands. Elevation ranges from five thousand to seven thousand feet, and annual precipitation is twelve to sixteen inches.

These well drained, dark colored soils are noncalcareous throughout. They have a thin loam surface layer and a clay loam subsoil. The subsoil is underlain by granite bedrock at depths of twenty to forty inches.

Natural fertility and organic matter content are low, and permeability and available water holding capacity are moderate.

6. Carbol Series. The Carbol soils are most extensive in the uplands adjacent to Butte and comprise about thirty five percent of the area. They developed in place from granitic rock on rolling to hilly uplands. Elevation ranges from five to seven thousand feet, and annual precipitation is twelve to sixteen inches. These well drained, dark colored soils are noncalcareous throughout. They have a thin loam surface layer and a clay loam subsoil. The subsoil is underlain by granite bedrock at depths of ten to twenty inches.

Natural fertility and organic matter content are low. Permeability is moderately rapid, and the available water holding capacity is low.

7. Woodrock Series. The Woodrock soils are most extensive in the uplands south and east of Butte and comprise about three percent of the area. They developed under forest cover from granitic material on hilly to steep mountainous areas. Elevation ranges from five thousand to seven thousand feet, and annual precipitation is twelve to sixteen inches.

These well drained light colored soils are noncalcareous throughout. They have a very thin layer of forest litter or duff and a thin stony loam surface layer. The subsoil is stony clay loam and overlies granite bedrock at depths of twenty to forty inches.

Natural fertility is moderate. Organic matter content is low. Permeability and available water holding capacity are moderate.

## Conclusions

The soils of Silver Bow County generally have not been difficult to deal with where shallow domestic water wells and individual sewage drainfields have been constructed. The large amounts of alluvium and other surface soils have been found to be extremely variable in permeability, however. This has had an effect on both the quantity of water available in the shallow domestic wells and the successful operation of individual sewage drainfields. As shown on the accompanying soil interpretation maps for the Butte area, some areas of extensive clay and silt deposits require special care in the construction and operation of septic tank drainfields.

Construction of municipal water and sewer systems in the various soils of Silver Bow County has not been found to be difficult. Pipeline trench digging in the sands and clays is extremely easy while the coarse materials such as stream gravels slow operations somewhat. Bedrock at shallow depths is not common in the valley bottoms; however, it can be expected at normal water and sewer line installation depths near the top of the mountain slopes.

Source: "Soil Survey and Interpretations for Resource Planning and Urban Development" Butte, Montana, U. S. Department of Agriculture, Soil Conservation Service, 1970.

# COMMUNITY WATER SYSTEM FACILITIES

## General

This comprehensive report covers the overall problems, existing or projected, for Silver Bow County, Montana. The volume of data processed and evaluated and the intent of the report allow only a general analysis of any one system.

The intent of this report is to point out the general needs of each community with the objective that each community may in the future be

provided with a safe and adequate water system. The general solutions to overall problems suggested in this report may have to be modified when detailed studies are made. These modifications may be in exact size of parts of a system or in some detailed design variation but will not detract from the overall value of the general information presented.

Basically, the demand for water from community systems is for domestic, fire fighting, and industrial uses. The demand for industrial water supply in small communities has not been extensive in Montana and in most cases will not control the design of community systems. Sufficient water for fire fighting must be considered; however, economic feasibility will usually control the extent of such facilities. In most small communities a system with sufficient capacity to give high ratings for fire protection would require facilities considerably larger than necessary for domestic purposes. The community might be unable to finance such an improvement; the approach, therefore, has been to propose a system suitable for present domestic needs. These basic facilities can be expanded for more complete service and for higher fire ratings as it becomes economically feasible.

The domestic use of water has increased greatly in recent years. This is partially due to improved economic conditions which make it possible for families to acquire such water consuming appliances as dishwashers, waste disposal units, and automatic washing machines. Water use for beautifying property has also increased. The most essential condition is adequate, safe, and potable water for domestic purposes, and this has been the primary consideration in this study. Appendix II contains further information on analysis criteria.

## Basic Considerations

Communities studied in this comprehensive plan were those with a minimum of five potential users and a maximum population of 5,500. Each community within this category was visited at least once. During these visits the type of water facilities available was examined, and an evaluation of the facilities was made from the standpoint of fulfilling the needs of the residents.

The existing systems were found to be quite varied in their operation, condition, and suitability for serving the needs of the users. The situation in each community was evaluated separately; however, some general classification of the various systems was possible. These are described briefly in the following paragraphs so that the general philosophy of the analysis can be shown.

1. In some communities the homes are quite widespread and few in number. Good water in adequate quantities can be found at reasonable depths, and for such situations private wells will provide a safe and suitable water system.

2. Many communities have had access to good water from private wells for many years. In some of these communities population is increasing, and the area is becoming more densely settled. As a result, tests for bacteriological quality of well water occasionally indicate that pollution is present. When this occurs, it is usually the beginning of a problem which will continue to worsen. Increasing population and a higher potential for contamination indicate the need for a safe community water facility. The system should be one which will serve the domestic needs of the present residents with provisions for improvements and expansion as needed.

3. Many communities have enjoyed a central water system for years but have not made annual improvements and replacements. This has resulted in overloaded and antiquated systems. Suggestions for immediate improvements which will fit into an overall replacement program are included in this report.

4. Some communities which have experienced a steady population growth are finding that their water systems are inadequate for present demands and will require enlargement. Population projections and economic trends are used to determine the need for improvements and also to justify the type and extent of proposed improvements.

## Silver Bow County

The estimated 1970 population of Silver Bow County is 42,000. Approximately 24,700, or fifty nine percent, of these people are presently served by central water systems, and the remainder are served by private facilities such as wells and springs. By 1990 about 24,900, or sixty percent of the population, will have access to central water systems if the schedule of proposed improvements is followed. It is expected that the remaining forty percent will live in outlying areas, and the homes will not be close enough together to make central systems feasible.

## Melrose

Existing System. The estimated 1970 population of Melrose is 180. The population is expected to decline slightly throughout the planning period. The source of water in the community of Melrose is individual wells. The water obtained from these wells is quite hard although the

quality is good. There has been concern within the community that some well contamination has occurred and that a potential health hazard exists. Many residents have cleaned existing wells or have drilled new wells to avoid contamination. The average depth of the wells in the area is forty eight to fifty feet.

There has been no serious consideration for the construction of a central water system in the community of Melrose; however, homes in the community are closely spaced, and it would be feasible to construct such a system. It is recommended that a central water system be constructed during the planning period.

Improvements Next Five to Ten Years. By 1975 the population is expected to be 180. It is proposed that a water system similar to the one shown on Map 6 be constructed during this period. Well records indicate that a well capable of producing one hundred gpm could be developed near the Big Hole River west of the community or at an alternate location within the community. A storage facility with a minimum capacity of forty thousand gallons could be constructed on a hill east of the community. Supply and distribution for the system would be provided by a six inch diameter pipe network.

Improvements by 1990. The 1990 population is expected to be 150. The water system proposed under the five to ten year plan will result in a facility which is adequate for the needs throughout the remainder of the planning period. Only periodic maintenance and repair will be necessary during this time.

Ramsay

Existing System. The present population is estimated to be one hundred, and this population is expected to decline slightly throughout the planning period. The area presently served by the community water system is shown on Map 7. The community of Ramsay obtains its water supply from two deep wells located north of Interstate 90. Both wells are approximately 250 feet deep and together supply over three hundred gpm. The water obtained from these wells is good; although, it is moderately hard. Storage for the water system is provided by an elevated storage tank with a capacity of fifty thousand gallons. The storage tank is located north of Interstate 90 near the two wells. Two years have passed since the tank was repainted and inspected for defects. The six inch diameter water supply line for the community crosses beneath Interstate 90 and also crosses a thirty four inch diameter water line owned by the Anaconda Company. The community of Ramsay has a tap into the Anaconda water line for emergency fire use only. Treatment for the Ramsay water system is provided by an automatic chlorine injector with an accompanying mix tank. There have

been no reported pollution or contamination problems.

The type of pipe used in the distribution system is cast iron within the community and asbestos cement crossing Interstate 90. Pressure in the system is approximately forty to forty five pounds per square inch (psi). There is some two and one half inch diameter pipe in the distribution system, and this causes severe pressure drops in the summer. There are thirty one homes and one school hooked to the system.

Improvements Next Five to Ten Years. The population of Ramsay is expected to decline to ninety by 1975. Water supply and storage within the existing system are more than adequate to serve the needs of this community throughout the planning period. During this time it is expected that the only improvement necessary will be the replacement of small diameter distribution piping to improve pressure and flow characteristics during periods of high demand.

Improvements by 1990. The population is expected to be sixty by 1990. No expansion or improvement of the existing system is anticipated to be necessary during this time.

## Rocker

Existing System. The estimated 1970 population of Rocker is 110. This population is expected to increase slightly throughout the planning period. The town of Rocker obtains its water from individual wells and a partial central water system. Individual wells provide good water although it is quite hard. Plenty of water is available from these wells which range in depth from twenty seven to forty eight feet. The best water is available from the deepest wells, and there has been some pollution reported in the shallow wells.

The existing partial water system obtains its water supply from a spring south of the community. The springs were developed by the Butte, Anaconda, and Pacific Railroad which still retains full ownership. The spring water is reported to be of excellent quality. Storage for the system is provided by two twenty four by forty by twelve foot deep enclosed reservoirs. The reservoirs are constructed of wood and are quite old. Treatment for the system is provided by the railroad and consists of chlorination in each of the two reservoirs. The four inch diameter transmission line to the community from the reservoir is quite old and is becoming corroded. Distribution pipe within the community consists of iron and wood. Pressure in the system is adequate for domestic use but not for fire use. The system is quite outdated and needs a considerable amount of work to bring it up to date and to provide the community with adequate water

supply. The approximate layout of this existing system is shown on Map 8.

Improvements Next Five to Ten Years. The population of Rocker is expected to be 110 by 1975. It is recommended that the existing water system be revised so that water supply and distribution meet present day standards. The design criteria of this report indicates that a water source providing seventy gpm and water storage with a capacity of thirty thousand gallons are needed to provide this community with adequate water supply. A proposed water system which could replace the existing system would serve the area shown on Map 8. In order that adequate pressures could be provided for the community, storage may have to be located at a higher elevation or constant pressure pumping facilities would have to be installed. The water supply and distribution system network would consist of six inch diameter pipe. Further detailed engineering study and analysis will be necessary to determine which combination of facilities will provide the most economical water system.

Improvements by 1990. The population of Rocker is expected to increase to 120 by 1990. The water system proposed under the five to ten year plan will result in a facility which is adequate for the needs throughout the remainder of the planning period. Only periodic maintenance and repair along with the extension of the distribution system to handle growth areas will be necessary during this time.

## Divide

Existing System. The present population is estimated to be forty. This population is expected to decline to twenty by 1990. Individual wells supply the water for the residents of Divide. The quality of the water obtained from these wells is good; however, the water is quite hard. Plenty of ground water is available from wells which average approximately thirty feet deep. The homes in this community are quite widespread, and it is not believed that any type of central water system is feasible at this time or throughout the planning period. The present use of private wells will result in an adequate water system for the community needs.

## Silverbow

Existing System. The estimated 1970 population of Silverbow is forty. Population projections indicate that this population will decline to approximately thirty by 1990. The community of Silverbow obtains its water from individual wells. The water obtained from these wells is moderately hard, and the general quality is good. Plenty of ground

water is available, and no pollution or contamination exists in the wells which are from sixty to sixty five feet deep. There have been contamination problems reported in wells which are shallower in depth. A central water system for this community is not considered to be practical or necessary, as the use of private wells will result in an adequate water system for the community.

## COMMUNITY SEWER SYSTEM FACILITIES

### General

Each use of water adds some material or alters some characteristic enough to change the original quality of the water and often to pollute it. The transportation and dilution of municipal, industrial, and agricultural wastes are important and necessary uses of water; therefore, special emphasis is placed on the control of water pollution from these sources. Some of these wastes can be carried in limited amounts without damage to the resource. Some wastes if discharged into water courses can make their way into underground aquifers and pollute the ground water so that it is unsuitable for further use.

Pollution by definition and interpretation is a matter of degree. Since it is inevitable that the quality of water will be altered with each use, it is of critical importance to control the degree of pollution.

It is public policy established by the state legislature to maintain reasonable standards of purity for the water of the state. These standards are to be consistent with the use of these waters, including their use in carrying away the water borne waste products of society. The current Federal Water Pollution Control Act in reference to pollution abatement gives the individual states discretion in assessing the physical and economic feasibility of complying with water quality standards. The "Water Quality Criteria," "Water Use Classifications," and "Policy Statements" of the Montana Water Pollution Control Council for streams and rivers in Montana have been included in Appendix I.

Sewage may be broadly categorized as domestic or municipal waste, industrial waste, and animal or agricultural waste. Animal wastes are usually not involved in community sewage facilities; however, they do constitute a potential source of pollution which must be controlled and prevented from entering streams or other potential water supplies.

Although industrial activity throughout Montana has been limited, the need for control and treatment of industrial wastes is apparent. Industrial wastes vary in quantity and composition as greatly as the

products and processes which generate them. They include toxic chemicals, solids carried in suspension, brines, strong acids and alkalies, oils, dyes, floating solids, and the heat generated by industrial processes. Industrial wastes are not found to be a major factor in the design of most community sewage facilities. Where economic projections indicate industrial development, the relationship to loading on domestic sewer systems is considered.

Domestic sewage is the primary consideration of this study and has been the basis for design and analysis. Where particular systems are subjected to loading from industrial sources, a more detailed study will be necessary. The general approaches outlined in "Analysis Criteria" in Appendix III will suffice in practically all cases.

Basic Considerations

There are generally three main methods of sewage disposal. These are septic tanks, mechanical sewage treatment plants, and wastewater stabilization ponds. Local soil conditions, availability of land, and density of population are the basic factors which govern the selection of a particular method.

Many of the smaller communities have relied on individual septic tanks and cesspools for each home to handle sewage disposal. Septic tanks are suitable if the population density is low and if the systems are properly designed and maintained. Overflow from these tanks must drain into the soil and, depending on local soil conditions, may or may not create a problem. There is a limit to the amount of water that even loose granular soil can absorb. Density of population and the length of time the effluent has been entering the soil are factors which indicate whether septic tanks can be suitable for sewage disposal.

When economically feasible, community sewage collection and disposal systems are much more desirable than individual systems. Community systems eliminate the worry of septic tank failure, the danger of well contamination, and the problem of soil saturation. However, it is usually uneconomical to serve a few homes scattered over a large area with a community sewer system.

The type of sewage disposal facilities to be used can generally be determined on the basis of economic factors. Mechanical treatment plants provide an excellent means of sewage disposal although the initial cost, maintenance cost, and power cost are usually high. Wastewater stabilization ponds are an ideal method of sewage disposal and usually are the most economical to construct and maintain.

The Montana Water Pollution Control Council has established the

criteria that treatment of domestic and industrial wastes shall be secondary treatment or its equivalent. For domestic sewage, mechanical treatment plants or stabilization ponds, when either is properly designed, constructed, and operated, meet these requirements.

A schedule for completion of secondary treatment facilities by communities across the state has been established by the State Department of Health. The target date is included for individual towns when applicable.

## Silver Bow County

In Silver Bow County only the people of Butte, Walkerville, and Ramsay are presently served by community sewer facilities. Approximately 24,700, or fifty nine percent of the county population, are served by these facilities. By 1990 approximately 24,900, or sixty percent of the population, will have access to community sewer facilities if the proposed expansion program is followed. The remaining percentage will live in outlying areas, and the homes will not be close enough together to make community sewer systems feasible.

## Melrose

Existing System. The 1970 population is estimated to be 180. This population is expected to decrease during the planning period. Sewage in Melrose is disposed of through septic tanks and drainfields. The major operational problem that exists is poor drainage due to surface-water runoff. The runoff saturates the drainfields and causes them to work improperly, and it is felt that this problem is the cause of pollution and contamination in shallow water wells. In general, soil in the area is quite rocky and gravelly, and flow of water through this medium is quite good. There has been no serious consideration of a central sewage system; however, it is recommended that planning for such a system begin now in order that existing and potential health hazards may be eliminated.

Improvements Next Five to Ten Years. The estimated 1975 population of Melrose is 180. A central sewer system is proposed to be constructed during this period, and the layout of this system is shown on Map 11. Such a system would consist of a collection network made up of eight inch diameter pipe and a treatment facility provided by a 1.8 acre wastewater stabilization pond located along the Big Hole River southwest of the community. It is possible that the entire system could operate by gravity; however, further study and investigation may indicate that a lift facility will be necessary. Exact location of the wastewater stabilization pond will depend upon economic

considerations and land acquisition possibilities.

Improvements by 1990. The population is expected to decline to 150 by 1990. The system as discussed in the five to ten year plan will be adequate to serve the needs of this community throughout the remainder of the planning period. Annual maintenance of the system will be necessary to keep it operating properly; however, no major expansion or improvement will be required.

## Ramsay

Existing System. The estimated 1970 population of Ramsay is one hundred. Sewage in Ramsay is disposed of through a central system which does not have a treatment facility. The layout of the system is shown on Map 12. The system consists of six inch diameter collection pipe and an eight inch diameter outfall line which drains to a point one quarter mile west of the community. The collection and outfall system is in good condition, and the only improvement necessary to this system is the addition of a treatment facility.

Improvements Next Five to Ten Years. The population of Ramsay is expected to be ninety by 1975. It is proposed that a wastewater stabilization pond be constructed in a location west of the community during this period. Plenty of sites are available to construct the stabilization pond which should have a total water surface area of 1.0 acres. The proposed location of this facility is shown on Map 12.

Improvements by 1990. The population of Ramsay is expected to decline to sixty by 1990. The existing collection system and the proposed wastewater stabilization pond constructed under the five to ten year plan will continue to serve the community throughout this portion of the planning period.

## Rocker

Existing System. The estimated 1970 population of Rocker is 110. Sewage in Rocker is handled by a partial central sewage system and septic tanks and cesspools. The septic tanks and cesspools operate normally as there is a clay topsoil underlain at shallow depth by gravel and rocky soil. This soil provides good drainage for drainfields and only normal operational problems have been encountered.

The existing sewer system in Rocker consists of four and six inch diameter pipe in fair condition. Some of the pipe is quite old; however, portions of the six inch diameter pipe system were just recently installed. The collection system, shown to approximate scale

on Map 13, consists of individual short lines serving several homes and discharging directly into Silver Bow Creek. There is no treatment for any portion of the sewer system in Rocker. The community of Rocker is interested in expanding and revising the existing sewer system to include all residents of the community and also plans to add a treatment facility to the system.

Improvements Next Five to Ten Years. The population of Rocker is expected to be 110 by 1975. It is proposed that a central sewer system facility to serve the area shown on Map 13 be constructed to revise and replace the existing system. The wastewater stabilization pond with a 1.2 acre surface area could be located west of the community and would be the most economical method of sewage treatment for this system. It is apparent, however, that land acquisition for the location of this facility might be a problem. An alternate solution would be the installation of a twelve thousand gallon per day (gpd) wastewater treatment plant which could be located on the bank of Silver Bow Creek just west of the community. The system could operate entirely by gravity through a collection system and outfall line consisting of eight inch diameter pipe. Further detailed engineering investigation will reveal the most economically feasible methods for collection and treatment in this system.

Improvements by 1990. The population of Rocker is expected to increase to 120 by 1990. A community sewer system facility built during the five to ten year period would be sufficient to serve the needs of the community throughout the remainder of the planning period. The only improvement necessary during this period would be expansion to serve additional areas.

## Divide

Existing System. The forty persons who presently reside in this community use private septic tanks and cesspools for sewage disposal. These individual systems operate normally, and there are no pollution or contamination problems apparent. The surface soil in the area is twenty four to thirty six inches of heavy clay. Below the clay is very gravelly soil which provides good drainage. The homes in this community are quite widespread, and the installation of a central sewage system would be impractical. It is not anticipated that improved sewage facilities will be necessary during the planning period as the individual systems will continue to provide adequate service for the needs of the community.

Silverbow

Existing System. The 1970 population of Silverbow is estimated to be forty. This population is expected to decline to thirty by 1990. Sewage in Silverbow is disposed of through septic tanks and cesspools with or without drainfields. The soil in the Silverbow area consists of a considerable depth of heavy clay topsoil. The clay causes drainage problems with septic tanks; however, it has been found that drainfields dug to adequate depths and lengths and backfilled with gravel provide good service. The residents of Silverbow have experienced only normal operational and maintenance problems with properly installed individual sewage systems, and it is believed that these systems will continue to serve the community adequately throughout the planning period. A central sewer system facility is not proposed for this community.

## PREFACE TO MAPS

The following maps have been prepared from several sources. The county maps were prepared from Transverse Mercator Projection Series Maps and Montana Highway Department Maps, Planning and Survey Series. The reduction of the county maps necessary for this publication makes them useful for general reference purposes only.

The town and community base maps used herein are taken from Montana State Highway Commission City and Town Plats prepared from aerial photographs dated 1961 to 1969 and have been updated where necessary. On-site surveys, plats obtained from individual towns, and aerial photography conducted in 1970 were also used. Uncontrolled mosaics have been used and scales are, accordingly, only approximate and are shown for referencing purposes only. The mapping operation was supplemented by field checks made during 1970.

Land use information was obtained by field surveys, supplemented and checked by aerial photography during 1969 and 1970.

Water and sewer systems maps show existing facilities for individual towns and communities except where the information was not available. Data concerning these community facilities was obtained from the records of the individual communities and of the State Department of Health. Water and sewer lines are shown in the center of streets to indicate the existence of lines rather than precise locations. The sizes of lines, obtained from the most current information available, are indicated when possible. The locations of recommended improvements are given as relative locations and are not meant to be scaled from the individual town or community maps.

INDEX TO MAPS


| Title | Map Number |
|---|---|
| SILVER BOW COUNTY TOPOGRAPHY | 1 |
| STATEWIDE UTILITIES SYSTEM & RECREATION AREAS | 2 |
| SILVER BOW COUNTY LAND OWNERSHIP | 3 |
| SILVER BOW COUNTY SOILS | 4 & 5 |
| MELROSE WATER SYSTEM | 6 |
| RAMSAY WATER SYSTEM | 7 |
| ROCKER WATER SYSTEM | 8 |
| DIVIDE | 9 |
| SILVERBOW | 10 |
| MELROSE SEWER SYSTEM | 11 |
| RAMSAY SEWER SYSTEM | 12 |
| ROCKER SEWER SYSTEM | 13 |

# MAP I

# COUNTY MAP
## GENERAL RELIEF

## LEGEND

CITIES-TOWNS

COUNTY SEAT

ROADS-HIGHWAYS
STATE HIGHWAY U. S. HIGHWAY

RAILROADS

STREAMS-LAKES

COUNTY BOUNDARY

INDIAN RESERVATION

0-3,000 FT. ELEVATION

3-5,000 FT. ELEVATION

5-7,000 FT. ELEVATION

OVER 7,000 FT. ELEVATION

# MAP 2

# LEGEND

## MAJOR STATE-WIDE COVERAGE

### POWER AND GAS SYSTEMS

- ☐ POWER PLANT (IN MEGAWATTS)
- – – – 1 to 50 KILOVOLTS
- ——— 51 to 100 KILOVOLTS
- –·–·– 101+ KILOVOLTS
- ····· PROPOSED LINES
- —•—•— GAS LINES

### RECREATION AREAS

1. LOST CREEK STATE PARK
2. LEWIS AND CLARK CAVERNS STATE PARK
3. LAKE MARY RONAN STATE PARK
4. MEDICINE ROCKS STATE PARK
5. ROSEBUD STATE PARK
6. ROCK CREEK STATE PARK
7. MAKOSHIKA STATE PARK
8. WEST SHORE STATE PARK
9. WOODS BAY STATE PARK
10. BITTERROOT LAKE STATE PARK
11. ASHLEY LAKE STATE PARK
12. LONE PINE STATE PARK
13. JAMES KIPP STATE PARK
14. HOOPER MEMORIAL STATE PARK
15. HELL CREEK STATE PARK
16. FINLEY POINT STATE PARK
17. ELMO STATE PARK
18. FLATHEAD LAKE STATE PARK
19. YELLOW BAY STATE PARK
20. WALSTAD MEMORIAL PARK
21. THOMPSON FALLS STATE PARK
22. WHITEFISH LAKE STATE PARK
23. WAYFARERS RECREATION AREA
24. TIBER RESERVOIR RECREATION AREA
25. CLARK CANYON RESERVOIR RECREATION AREA
26. ENNIS RECREATION AREA
27. DEADMAN'S BASIN RESERVOIR RECREATION AREA
28. PAINTED ROCKS RESERVOIR RECREATION AREA
29. CANYON FERRY RECREATION AREA
30. LOGAN PARK RECREATION AREA
31. NELSON RESERVOIR RECREATION AREA
32. BEAVERTAIL HILL RECREATION AREA
33. GLACIER NATIONAL PARK
34. YELLOWSTONE NATIONAL PARK

▨ NATIONAL FORESTS

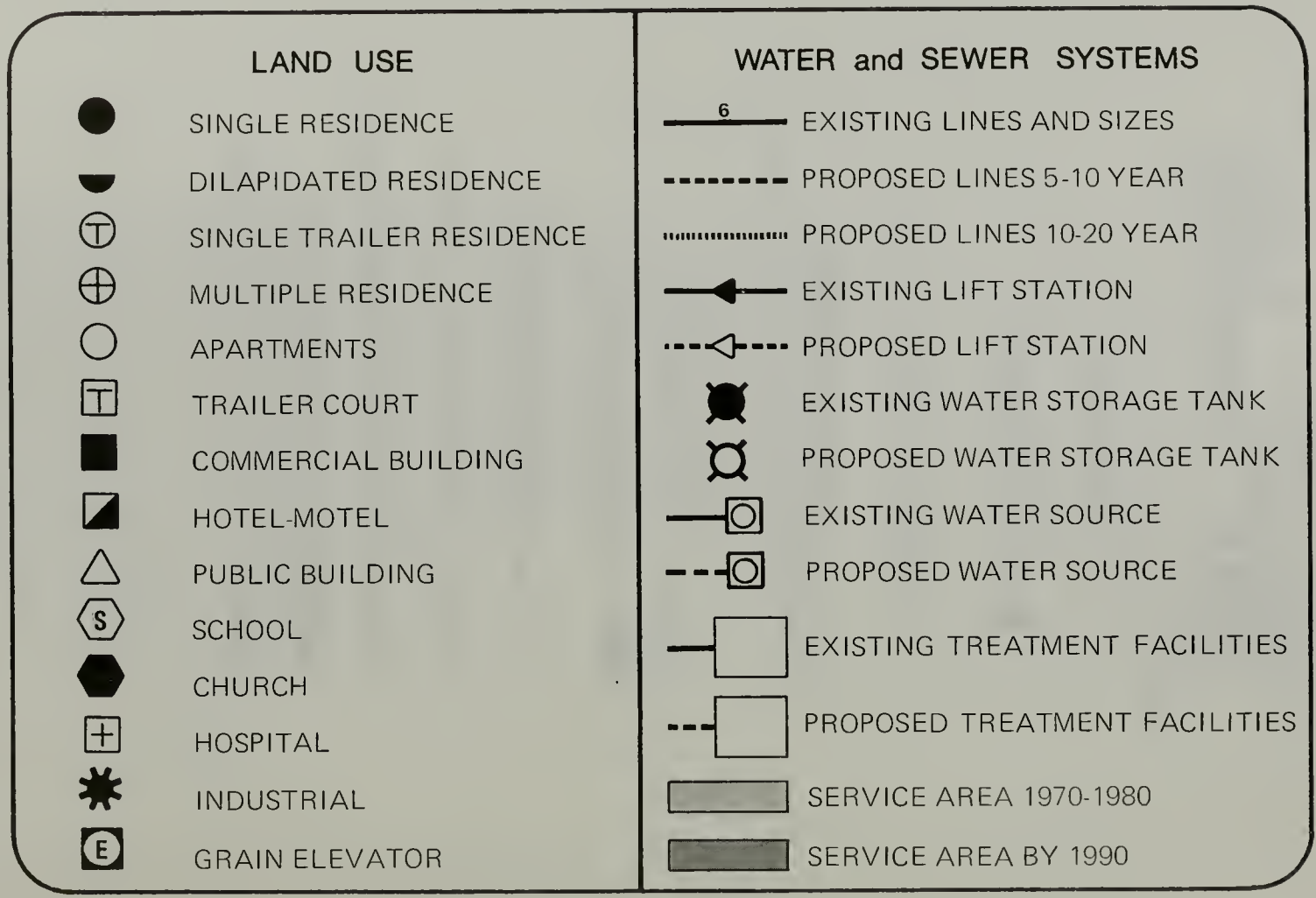
# MAP 3

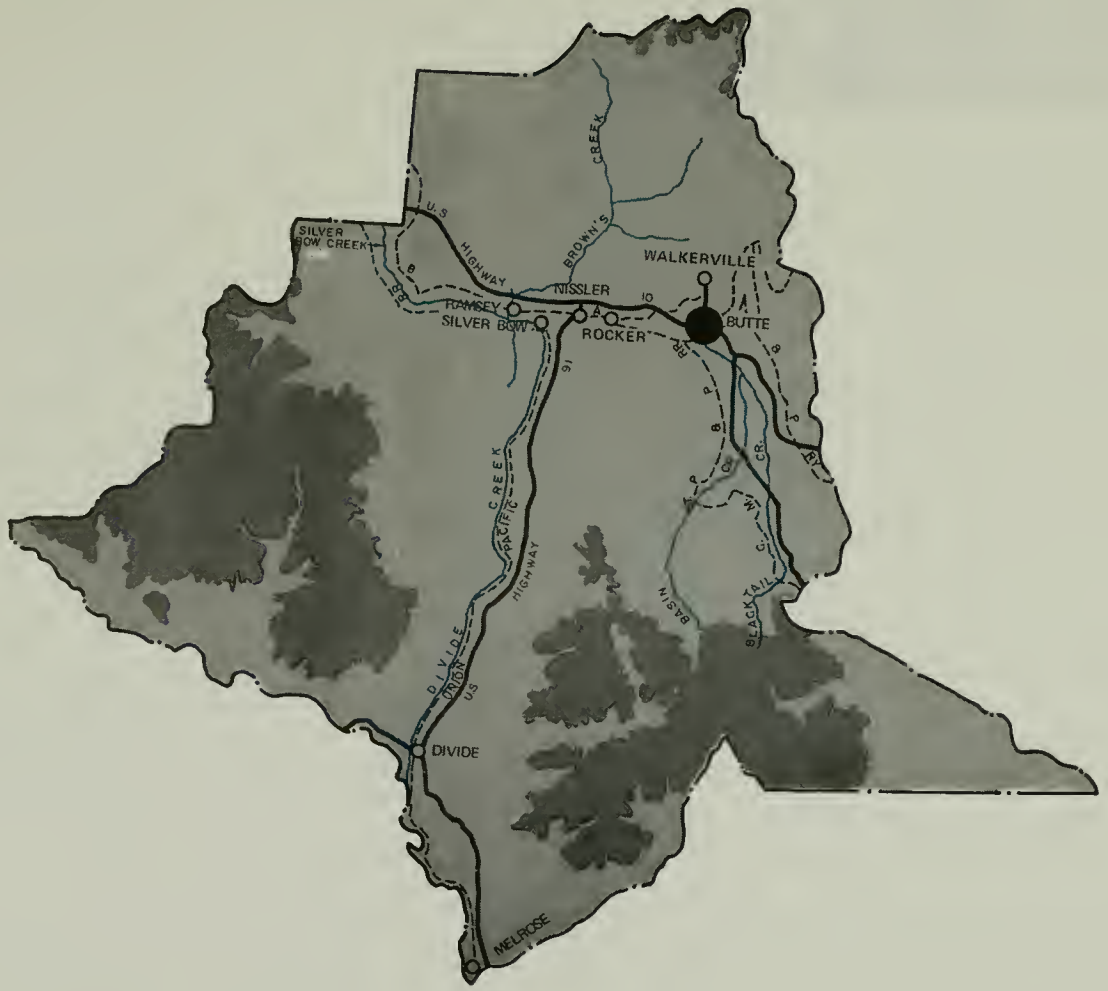
# COUNTY MAP
## LAND OWNERSHIP

## LEGEND

- CITIES-TOWNS
- COUNTY SEAT
- ROADS-HIGHWAYS
  - STATE HIGHWAY
  - U. S. HIGHWAY
- RAILROADS
- STREAMS-LAKES
- COUNTY BOUNDARY
- INDIAN RESERVATION
- PRIVATELY OWNED LAND
- STATE OWNED LAND
- FEDERAL OWNED LAND

# CITIES MAP LEGEND






-N-

**SILVER BOW COUNTY**

TOPOGRAPHY

SCALE

5 0 5 10 Miles

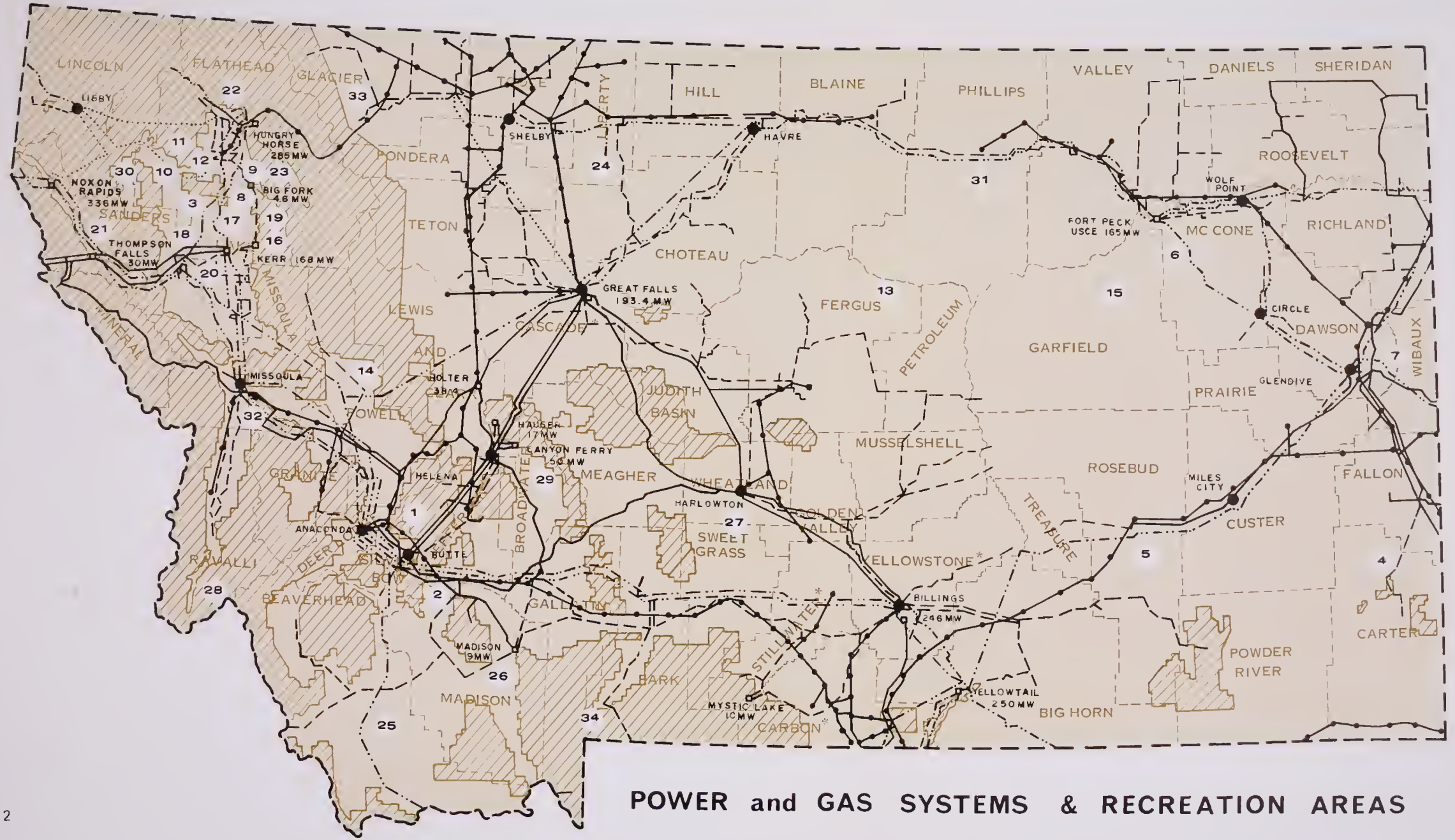
MAP 1

LINCOLN
LIBBY
30
NOXON
RAPIDS
336MW
SANDE
21
THOMP
FALLS
30M
MINERAL

MAP 2

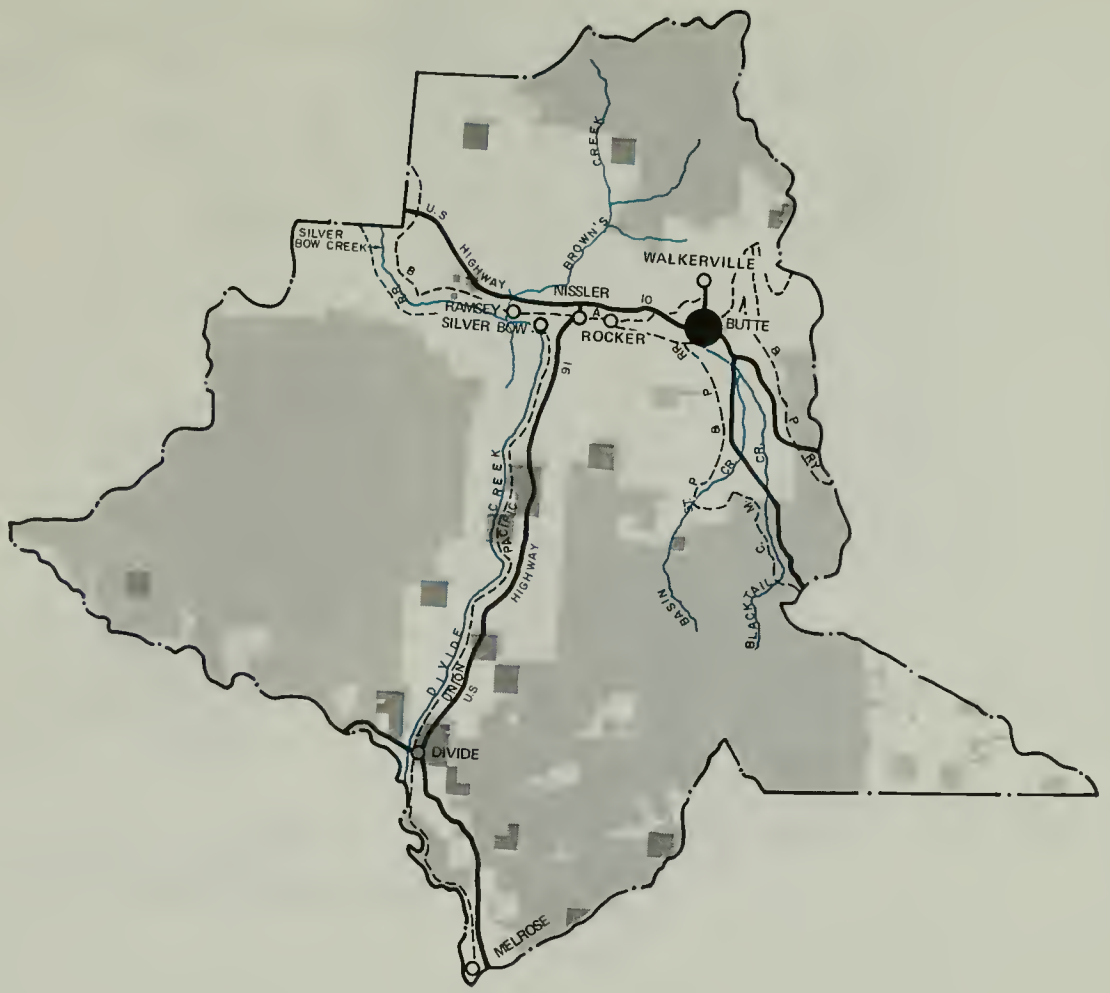

-N-
BOW COUNTY
AND OWNERSHIP
SCALE
10 Miles

MAP 3




MAP 2

# POWER and GAS SYSTEMS & RECREATION AREAS




-N-

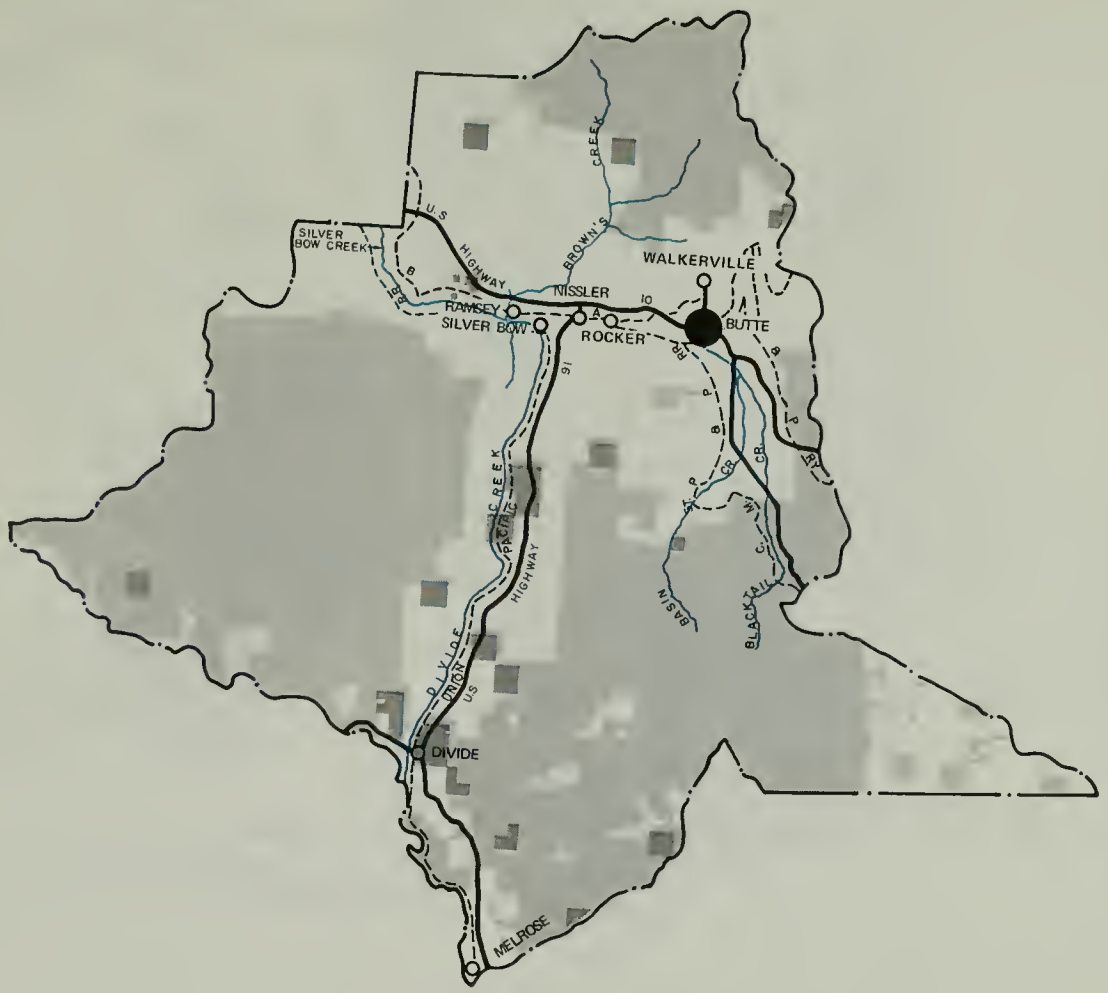
**SILVER BOW COUNTY**

LAND OWNERSHIP

SCALE

5 0 5 10 Miles

MAP 3




-N-

**SILVER BOW COUNTY**

LAND OWNERSHIP

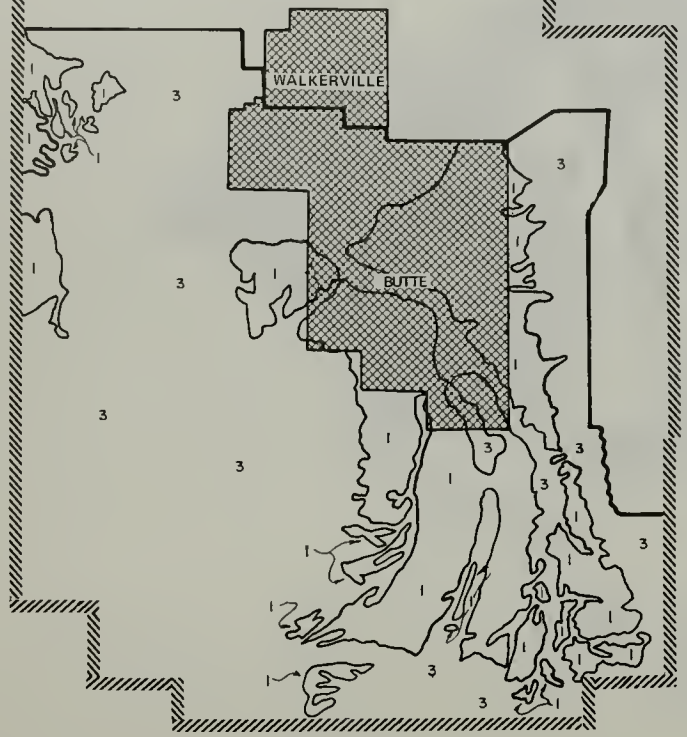
SCALE

5 0 5 10 Miles

MAP 3

# BUTTE - WALKERVILLE - SILVER BOW CO.
## PLANNING AREA

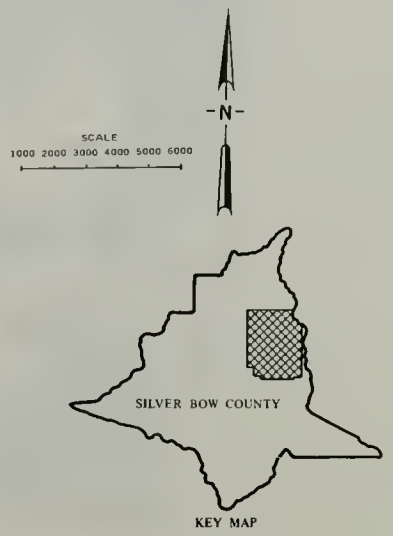
SOIL LIMITATIONS FOR FOUNDATIONS
FOR LOW BUILDINGS WITH BASEMENTS




MAP 4

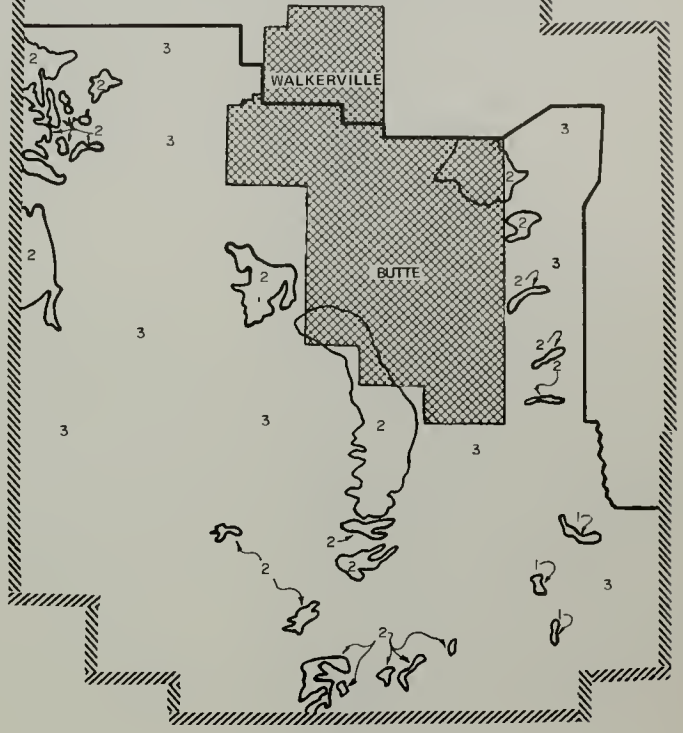
1. SLIGHT LIMITATIONS (90 percent of the area)
2. MODERATE LIMITATIONS (85 percent of the area)
3. SEVERE LIMITATIONS (85 percent of the area)

SOURCE: USDA-SCS



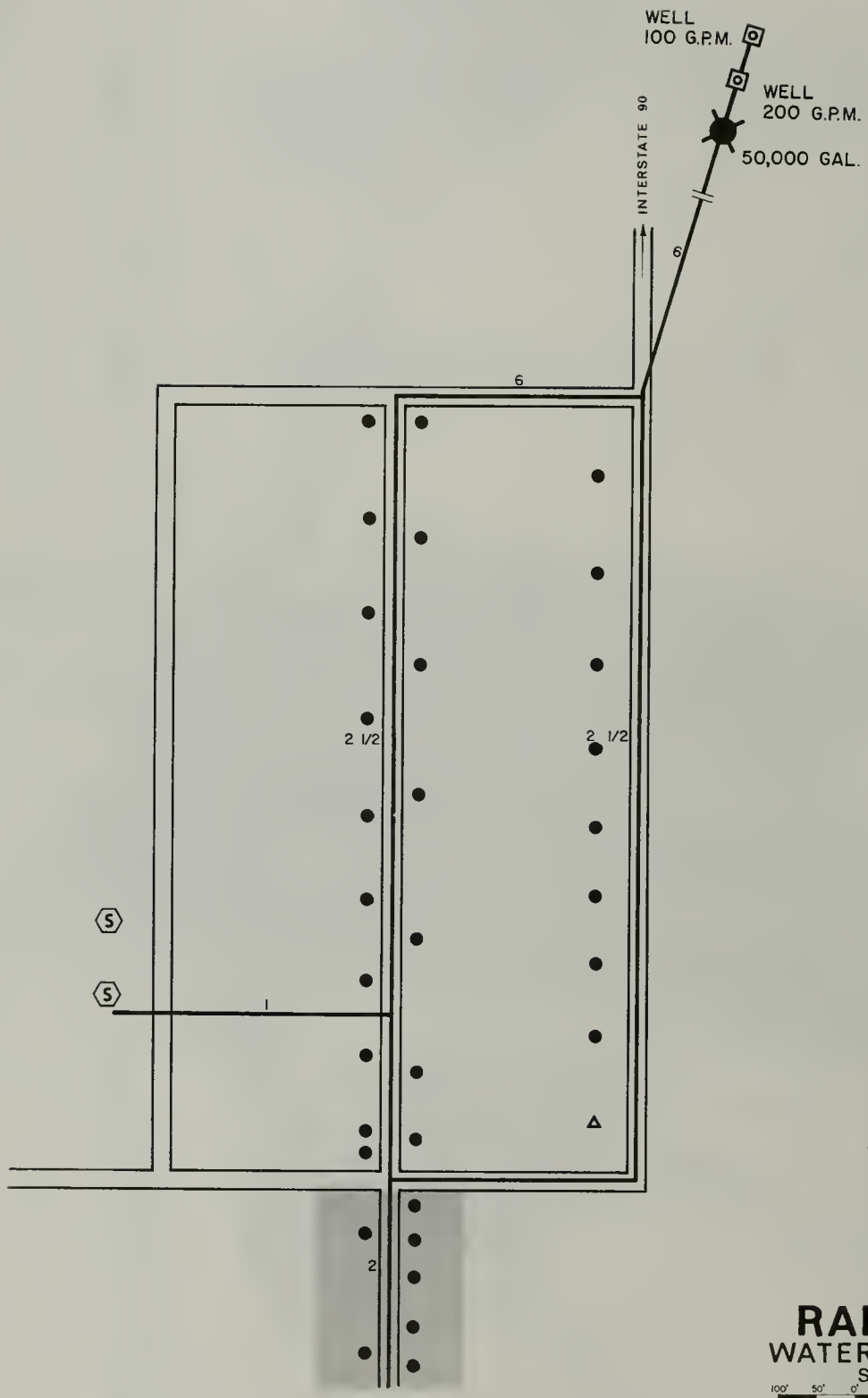

KEY MAP

SOIL LIMITATIONS FOR SEPTIC TANK FILTER FIELD




MAP 5

40,000 GAL.
6
16
RAILROAD
5TH AVE.
4TH AVE.
3RD AVE.
2ND AVE.
1ST AVE.
PLAZA AVE.
ST.
ST.
PACIFIC
UNION
HIGHWAY
BROAD
HECLA
BIG
HOLE
WELL
100 G.P.M.
6
CREEK
CAMP
RIVER
U.S.
N
MELROSE
WATER SYSTEM
SCALE
200' 100' 0' 200' 400'
MAP 6

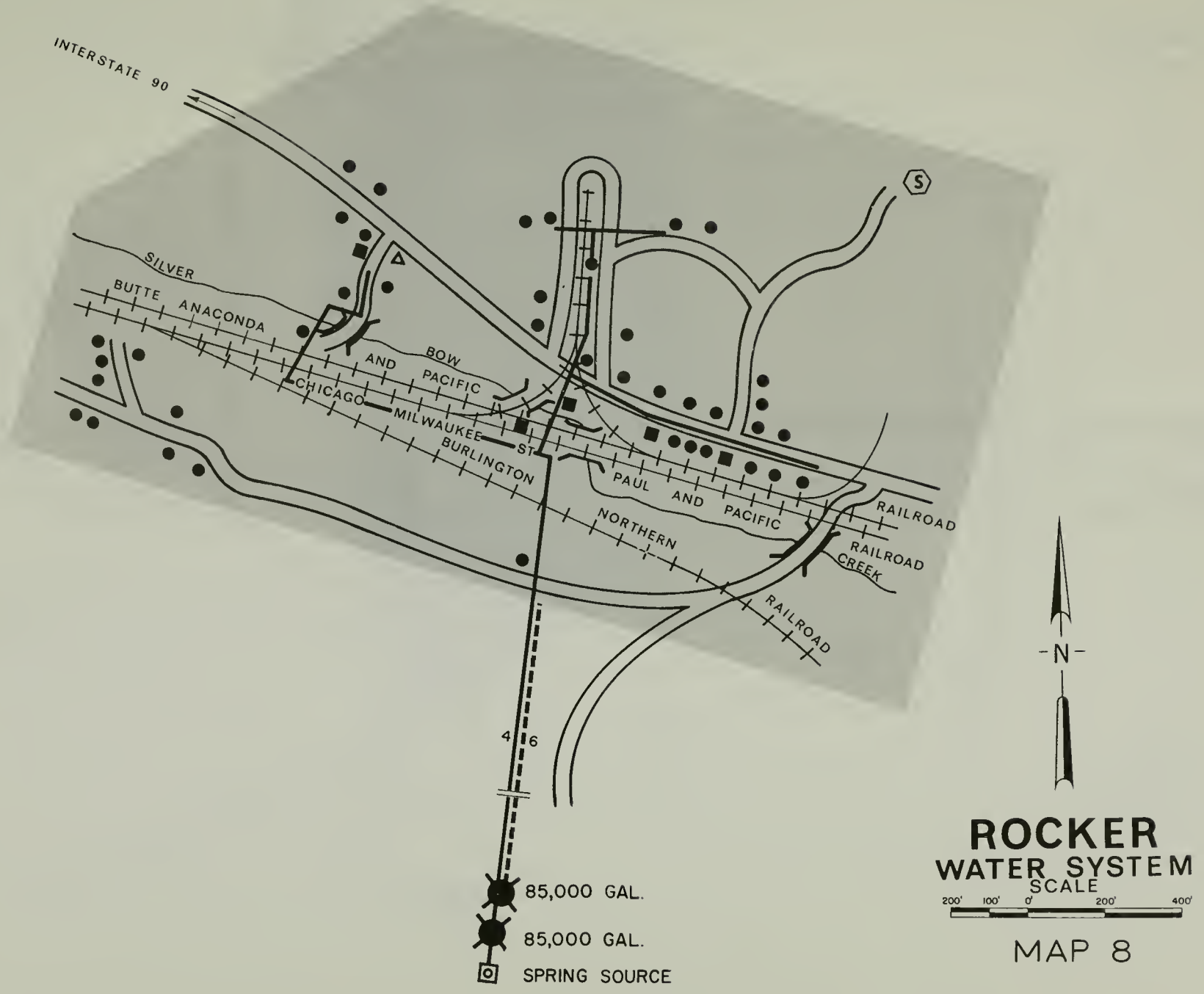



# RAMSEY
## WATER SYSTEM

SCALE

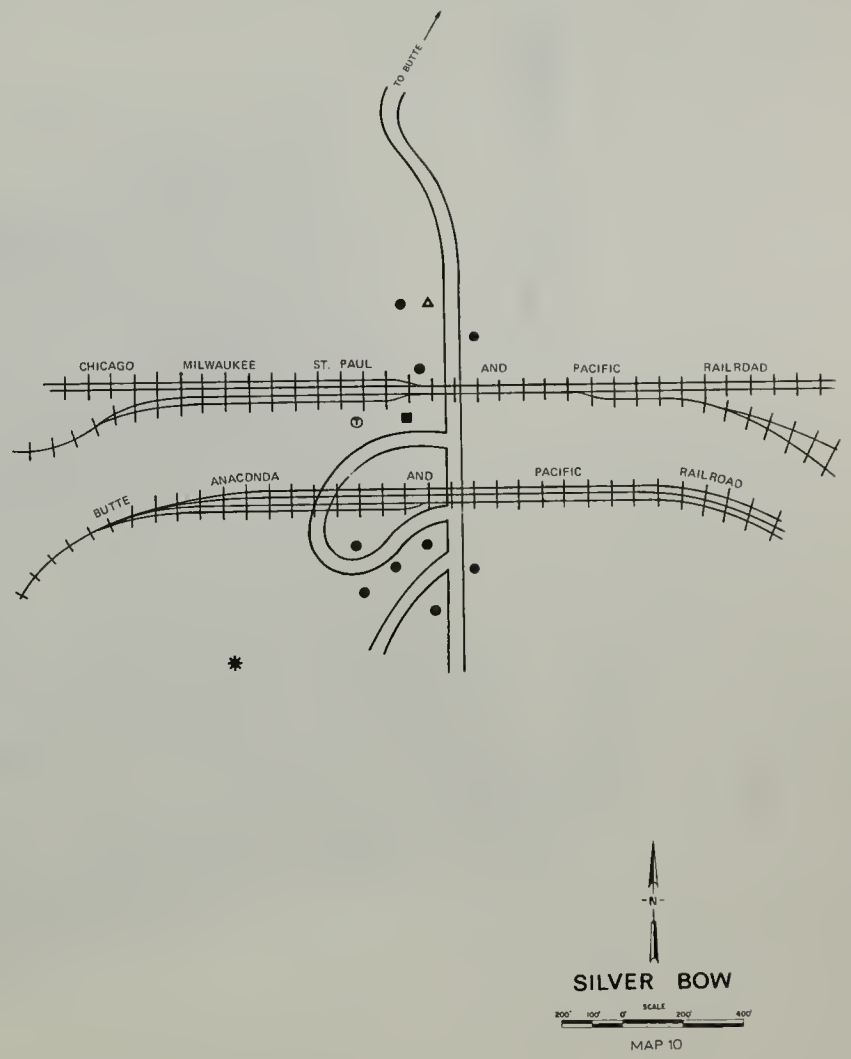
100' 50' 0' 100' 200'

MAP 7


INTERSTATE 90
S
SILVER
BUTTE
ANACONDA
BOW
AND
PACIFIC
CHICAGO
MILWAUKEE
ST
BURLINGTON
NORTHERN
PAUL
AND
PACIFIC
RAILROAD
RAILROAD
CREEK
RAILROAD
4
6
85,000 GAL.
85,000 GAL.
SPRING SOURCE
N
ROCKER
WATER SYSTEM
SCALE
200' 100' 0' 200' 400'
MAP 8

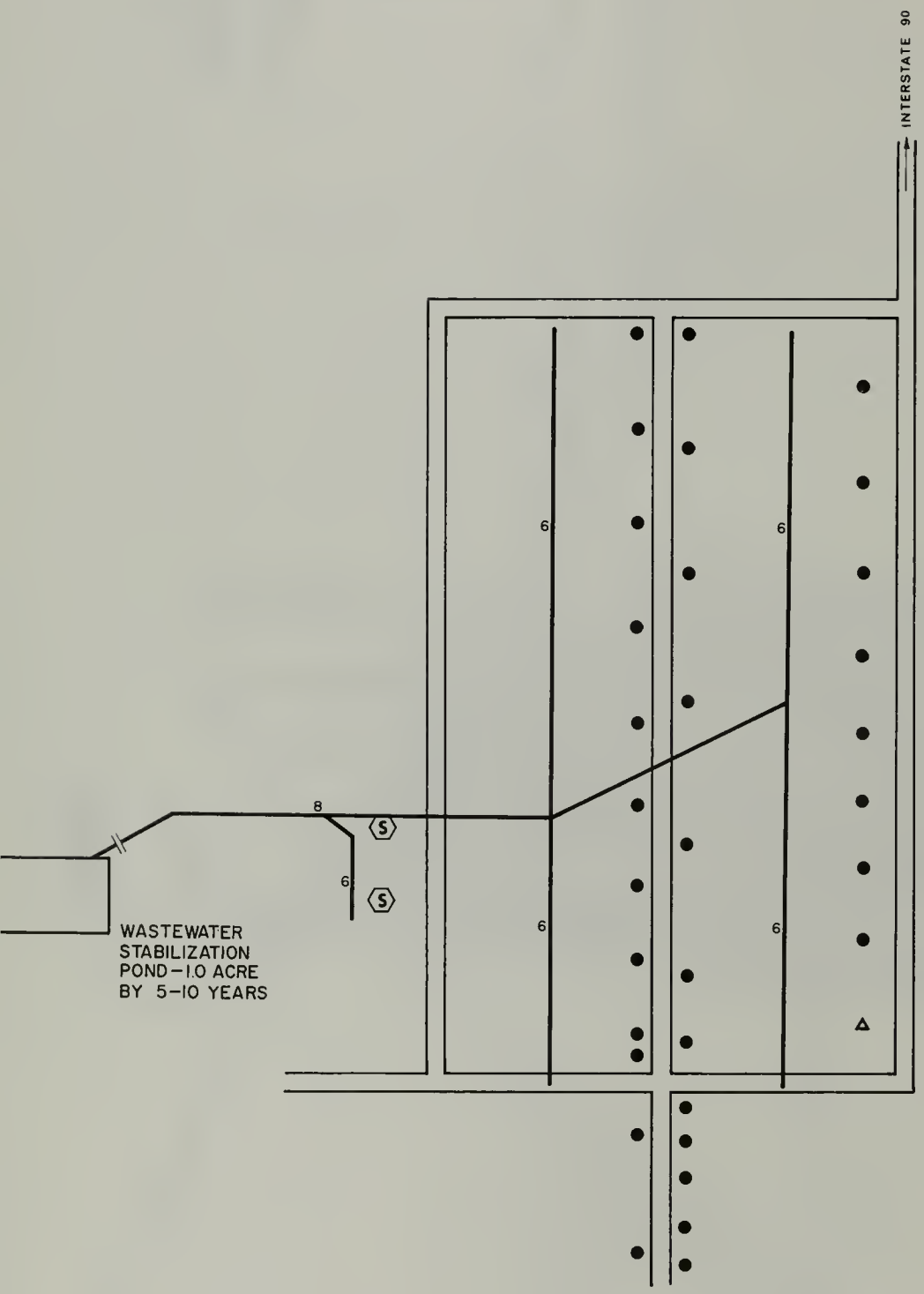
TO BUTTE
RAILROAD
91
HIGHWAY
CREEK
PACIFIC
TO WISDOM STATE
HIGHWAY
43
DIVIDE
UNION
U.S.
TO DILLON & MELROSE
-N-
DIVIDE
SCALE
200' 100' 0' 200' 400'

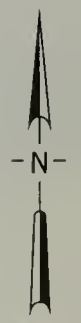
MAP 9


TO BUTTE
CHICAGO MILWAUKEE ST. PAUL AND PACIFIC RAILROAD
ANACONDA AND PACIFIC RAILROAD
BUTTE
-N-
SILVER BOW
SCALE
200' 100' 0' 200' 400'

MAP 10

RAILRDAD
91
5TH AVE.
4TH AVE.
3RD AVE.
2ND AVE.
1ST AVE.
PLAZA AVE.
ST.
ST.
PACIFIC
UNION
HECLA
BROAD
HIGHWAY
BIG
HOLE
CREEK
CAMP
RIVER
U. S.
8
WASTEWATER
STABILIZATION
POND-1.8 ACRES
N
MELROSE
SEWER SYSTEM
SCALE
200' 100' 0' 200' 400'
MAP 11



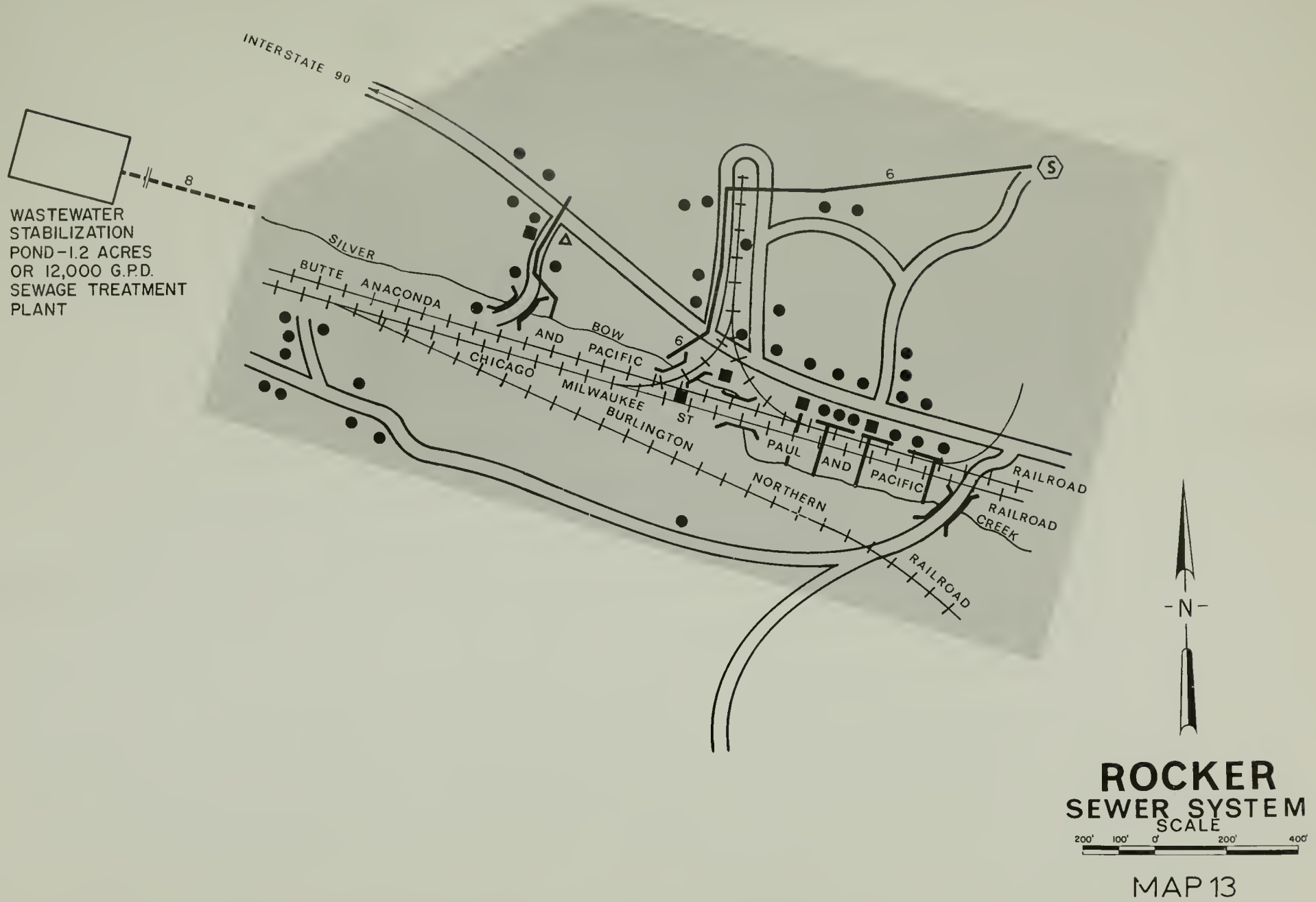

# RAMSEY

## SEWER SYSTEM

SCALE

100' 50' 0' 100' 200'

MAP 12


INTERSTATE 90
8
WASTEWATER STABILIZATION POND-1.2 ACRES OR 12,000 G.P.D. SEWAGE TREATMENT PLANT
SILVER
BUTTE
ANACONDA
AND
PACIFIC
BOW
CHICAGO
MILWAUKEE
ST
PAUL
AND
PACIFIC
RAILROAD
BURLINGTON
NORTHERN
RAILROAD
RAILROAD
CREEK
RAILROAD
6
6
S
-N-
ROCKER
SEWER SYSTEM
SCALE
200' 100' 0' 200' 400'
MAP 13

# APPENDICES

# APPENDIX I.

## MONTANA WATER LAW AND WATER QUALITY CRITERIA

### SURFACE–WATER LAW

Two basic laws which concern surface-water rights are recognized in the United States. They are the Doctrine of Riparian Rights and the Doctrine of Prior Appropriation. The Doctrine of Riparian Rights originated in England and is in widespread use in the eastern United States. Basically, this doctrine gives the owners of land bordering a stream the right to have that stream flow past their land undiminished in quantity and unaltered in quality and to use it for household and livestock purposes. Under the Riparian Doctrine, the water is restricted to riparian owners, and it is unlawful for them to reduce significantly the flow of the stream.

It was determined early in the history of Montana that the Doctrine of Riparian Rights was unsuited to the conditions here. First, it was obvious that diversion and reduction of stream flow was a necessity to mining and agricultural uses, and second, much of the land in Montana was under public rather than private ownership. The Doctrine of Prior Appropriation was much more suited to the region and was formally adopted by the Montana Supreme Court in 1921. The appropriation right originated in California where the early gold miners diverted water from streams to placer-mine gold. Water rights were considered in the same manner as mining claims; those who were first in time were first in right and the quantity or size of right was determined by the amount beneficially used.

The five basic points of the Doctrine of Prior Appropriation are:

1. The use of water may be acquired by both riparian and non riparian landowners.
2. It allows diversion of water regardless of the reduction of the water supply in the stream.
3. The value of the right is determined by the priority of the appropriation, i.e., first in time is first in right.
4. The right is limited to the use of the water. Stream waters in Montana are the property of the state and the appropriator acquires only a right to their use. Moreover, this use must be beneficial.
5. A right to the use of water is considered property only in the sense that it can be bought or sold; its owner may not be deprived of it except by due process of law.

No water right may be acquired on a stream in Montana without diversion of water and its application to a beneficial use. The method of acquiring or appropriating a right to water has been outlined by the state legislature. The procedure for appropriation from an unadjudicated stream is:

1. Posting of notice in a conspicuous place at the point of intended diversion stating:
   a. quantity of water claimed
   b. use for which water is claimed and place of use
   c. description of means of diversion
   d. date of appropriation
   e. name of appropriator
2. Filing, within twenty days after date of appropriation, of a notice of appropriation with the county clerk including in addition to the posted notice:
   a. name and description of the stream
   b. description of point of diversion with reference to a permanent monument or natural marker
   c. verification by affidavit of the appropriator that facts of the notice are true

Montana laws do not require that a water user file an official record of the completion of an appropriation. It is, therefore, a fact that in many instances the demand

for the water of a stream is much greater than the supply available. In such cases there is a means by which the rights and priorities of each user along a specific stream may be officially determined. The action of adjudication or water right suit may be initiated by any one or more of the appropriators. The Judge of the District Court then examines all of the claims and issues a decree establishing priority of right of each water user and the amount of water he is entitled to use.

The procedure for appropriation of water from adjudicated streams is slightly more complicated than that of unadjudicated streams. For adjudicated streams an appropriator shall:

1. Employ a competent engineer to survey the area and means of conducting water from its source to place of intended use.
2. Have aerial photographs and maps thereon to show the course of the intended diversion or location of intended impoundment.
3. File with the Clerk of the Court of the county of appropriation a petition which includes:
   a. the amount of water sought by appropriation
   b. a description of the watercourse or body from which water is intended to be appropriated
   c. a description of the means of diversion or size, location and manner of construction if a reservoir is intended
   d. the engineers survey and aerial photographs
   e. a declaration by the appropriator that the rights sought shall be subject to and bound by any decree theretofore rendered adjudicating the waters or any body to which the waters may be tributory
4. Name all others who have or appear to have rights in the source of supply as defendants in the appropriation proceeding.

Upon completion of the above procedure, a trial is held and normally a decree results. If a new appropriation is granted, the appropriator shall be bound by all prior rights and decrees.

## GROUND–WATER LAW

The quantity of ground water stored beneath the surface of the earth in Montana exceeds that on the surface. For many years use of this vast ground-water resource was very limited and no need for regulating its use was deemed necessary. In recent years the use and development of ground-water resources has increased considerably and it was realized that, without some means of regulation, ground water in some areas might be withdrawn at a faster rate than it could be naturally replenished.

In 1961 the 37th Legislative Session of Montana passed a bill which created a Ground Water Code in Montana (Chapter 237, Revised Codes of Montana, 1961). This bill became law on January 1, 1962, and the State Engineer of Montana was designated as the "Administrator."

The Ground-Water Law contains many provisions which are considered pertinent to this comprehensive plan, and, therefore, portions of these provisions will be presented in this report. They are:

Section 1. Definitions or Regulations As Used In The Act.

a. "Ground Water" means any fresh water under the surface of the land including the water under the bed of any stream, lake, reservoir, or other body of surface water. Fresh water shall be deemed to be the water fit for domestic, livestock, or agricultural use. The Administrator, after a notice of hearing, is authorized to fix definite standards for determining fresh water in any controlled ground-water area or sub area of the state.

b. "Aquifer" means any underground geological structure or formation which is capable of yielding water or is capable of recharge.

c. "Well" means any artificial opening or excavation in the ground, however made, by which ground water can be obtained or through which it flows under natural pressures or is artifically withdrawn.

d. "Beneficial use" means by economically or socially justifiable withdrawal or utilizations of water.

e. "Person" means any natural person, association, partnership, corporation, municipality, irrigation district, the State of Montana, or any political sub-division or agency thereof, and the United States or any agency thereof.

f. "Administrator" means State Engineer of the State of Montana.

g. "Ground-Water area" means an area which, as nearly as known facts permit, may be designated so as to enclose a single distinct body of ground water which shall be described horizontally by surface description in all cases and which may be limited vertically by describing known geological formations, should conditions dictate this to be desirable. For purpose of administration, large ground-water areas may be divided into convenient administrative units known as "sub-areas."

Section 2. Right To Use. Rights to surface water where the date of appropriation precedes January 1, 1962, shall take priority over all prior or subsequent ground-water rights. The application of ground water to a beneficial use prior to January 1, 1962, is hereby recognized as a water right. Beneficial use shall be the extent and limit of the appropriative right. As to appropriations of ground water completed on and after January 1, 1962, any and all rights must be based upon the filing provisions hereinafter set forth, and, as between all appropriators of surface or ground water on and after January 1, 1962, the first time is first in right.

Any ground water put to beneficial use after January 1, 1962, must be filed upon in order to establish a water right thereto. Four different types of forms have been provided for filing. The titles of the forms are:

Form No. 1 "Notice of Appropriations of Ground Water"
Form No. 2 "Notice of Completion of Ground Water by Means of a Well"
Form No. 3 "Notice of Completion of Ground Water Appropriation Without a Well"
Form No. 4 "Declaration of Vested Ground Water Rights"

Form No. 1 is optional and Form No. 4 was for those who had put ground water to a beneficial use before January 1, 1962. Again, it is important to recognize that the ground-water law states especially that, "Until a notice of completion (Form No. 2 or No. 3) is filed with respect to any use of ground water instituted after January 1, 1962, no right to that use of water shall be recognized."

## WATER QUALITY

The State Department of Health, under the supervision of the State Water Pollution Control Council, is responsible for administering the water pollution laws of the state. As stated in the resume of Montana water laws published by the Montana Water Resources Board, "the Department of Health has superivsion over all state waters which are directly or indirectly being used as a public water supply." The Water Pollution Control Council is responsible for classifying water and formulating a program for pollution control.

The Water Pollution Control Council has adopted specific "Water Quality Criteria;" established "Water Use Classifications;" and issued a complete list of "Policy Statements." The original adoption of these standards took place October 5, 1967, and since that time they have been made available to interested persons by the State Department of Health. A portion of the information available from the Department is the detailed chemical, physical, and biological standards of the "Water Quality Criteria" for effluent water. Water quality standards for domestic water, as set forth by the United States Public Health Service, are shown in Table A. The Montana Water Pollution Control Council "Policy Statements" and "Water Use Classifications" are presented in the following paragraphs.

The Water Pollution Control Council has added a new policy statement at the request of the Federal Water Pollution Control Administration. The new statement is:

*Waters whose existing quality is better than the established standards as of the date on which such standards become effective will be maintained at*

*the high quality unless it has been affirmatively demonstrated to the state that a change is justifiable as a result of necessary economic or social development and will not preclude present and anticipated use of such waters. Any industrial, public or private project or development which would constitute a new source of pollution or an increased source of pollution to high quality waters will be required to provide the necessary degree of waste treatment to maintain high water quality. In implementing this policy, the Secretary of the Interior will be kept advised in order to discharge his responsibilities under the Federal Water Pollution Control Act, as amended.*

**The originally adopted "Policy Statements" are:**

1. *Quality of waters classified for multiple use shall be governed by the most stringent criteria listed for any use.*
2. *The Council has classified as "A–Closed" only those waters on which access and other activities are presently controlled by the utility owner. If other uses are permitted by the utility owner, these waters shall be reclassified "A–Open" or lower. Conversely, waters in the "A–Open" classification, if shown to meet the "A–Closed" criteria, may be so classified by the Council at the request of the utility owner.*

   *Where "A–Open" water is used for swimming and other water contact sports, a higher degree of treatment may be required for potable water use.*
3. *The water quality standards are subject to revision (following public hearings and, in the case of interstate streams, concurrence of the Federal Water Pollution Control Administration) as technical data, surveillance programs and technological advances make such revisions desirable. There are waters in the state on which little water quality data is presently available. Water quality criteria for these waters was established to protect existing and future water uses on the basis of the most representative information available.*

   *In some cases, particularly in eastern Montana, waters have been classified "B" and "C" where the upper ends of the streams will probably be suitable for this use while the lower ends will not. However, not enough data is available to determine where the "B" and "C" designation should be dropped. Whenever a water supply or swimming area is developed, the regulations and the advice of the State Board of Health should be acquired. As time permits, data will be obtained and the classifications reviewed.*
4. *As used in the Water Quality Criteria, the phrases "natural," "naturally present" and "naturally occurring" are defined as conditions or material present from runoff or percolation over which man has no control or from developed land where all reasonable land, soil and water conservation practices have been applied. Waters below existing dams will be considered natural.*
5. *It is the intent of the criteria that the increase allowed (temperature for example) above natural conditions is the total allowable from all waste sources along the classified stream.*
6. *Although the water quality criteria specify minimum dissolved oxygen concentrations, it shall be the policy of the Council to require the best practicable treatment or control of all oxygen-consuming wastes in order to maintain dissolved oxygen in the receiving waters at the highest possible level above the specified minimums.*
7. *For treatment plant design purposes, stream flow dilution requirements shall be based on the minimum consecutive seven day average flow which may be expected to occur on the average once in ten years.*
8. *Where sampling stations and points of mixing of discharges with receiving waters as mentioned in the water quality criteria are to be established on interstate waters, the concurrence of the Federal Water Pollution Control Administration will be solicited.*

## TABLE A
## Water Quality Standards

| Characteristic | Permissible Concentrations in Milligrams Per Liter | Objections to Concentrations Beyond Permissible Limits |
|---|---|---|
| Turbidity | 5* | Esthetic |
| Color | 15* | Esthetic |
| Threshold Odor Number | 3* | Esthetic |
| Alkyl Benzene Sulfonate (ABS) | 0.5 | Taste, Foaming, Indicator of Pollution |
| Arsenic (As) | 0.01 | Toxic |
| Chloride (Cl) | 250 | Possible Laxative Effect |
| Copper (Cu) | 1.0 | Possible Physiological Effect |
| Carbon Chloroform Extract (CCE) | 0.2 | Toxicological Interest |
| Cyanide (CN) | 0.01 | Toxic |
| Fluoride (F) | See Below | Mottling of Teeth |
| Iron (Fe) | 0.3 | Esthetic, Staining of Laundry |
| Manganese (Mn) | 0.05 | Esthetic, Staining of Laundry |
| Nitrate | 45 | Methemoglobinemia |
| Phenols | 0.0001 | Taste |
| Sulfates | 250 | Possible Laxative Effect |
| Total Dissolved Solids | 500 | Possible Laxative Effect |
| Zinc (Zn) | 5 | Possible Laxative Effect |
| Radium-226 | 3** | Radiation Damage |
| Strontium-90 | 10** | Radiation Damage |
| Gross Beta Radioactivity | 1,000** | Radiation Damage |

Concentrations in excess of following should be re-examined before use (mg/l):

| | | | |
|---|---|---|---|
| Arsenic (As) | 0.05 | Fluoride (F) | See Below |
| Barium (Ba) | 1.0 | Lead (Pb) | 0.05 |
| Cadmimum (Cd) | 0.01 | Selenium (Se) | 0.01 |
| Hexavalent Chromium (+6) | 0.05 | Silver (Ag) | 0.05 |
| Cyanide (CN) | 0.2 | | |

| Annual Average of Maximum Daily Air Temperature | Recommended Control Limits—Fluoride Concentrations in mg/l | | |
|---|---|---|---|
| | Lower | Optimum | Upper |
| 50.0 to 53.7 | 0.9 | 1.2 | 1.7 |
| 53.8 to 58.3 | 0.8 | 1.1 | 1.5 |
| 58.4 to 63.8 | 0.8 | 1.0 | 1.3 |
| 63.9 to 70.6 | 0.7 | 0.9 | 1.2 |
| 70.7 to 79.2 | 0.7 | 0.8 | 1.0 |
| 79.3 to 90.5 | 0.6 | 0.7 | 0.8 |

## Hardness Standards for Water

| Hardness in Milligrams per Liter | Degree of Hardness |
|---|---|
| 0 - 35 | Soft |
| 36 - 100 | Medium |
| 100 - 150 | Hard |
| Over 150 | Extremely Hard |

* Standard Units. ** Pico-curies Per Liter.

Source: Ameen, Joseph S., Community Water Systems, 1960

9. *It is not the intent of these criteria to provide for a swimming water immediately below an existing treated domestic sewage outfall.*

10. *Where common treatment is practicable, it is the policy of the Council to restrict the number of sewer outfalls to a minimum.*

11. *Tests or analytical procedures to determine compliance with standards will, insofar as practicable and applicable, be made in accordance with the methods given in the twelfth edition of "Standard Methods for the Examination of Water and Waste Water" published by the American Public Health Association, et al., or in accordance with tests or analytical procedures that have been found to be equal or more applicable.*

12. *Because of conflicting testimony, it is the intent of the Water Pollution Control Council to obtain additional information on temperatures and fisheries on waters below existing steam generating stations at Billings and Sidney on the Yellowstone River. This can probably be best accomplished by a cooperative study between the utility, State Fish and Game Department, Federal Water Pollution Control Administration and the Montana State Department of Health.*

13. *Insufficient information is available for establishing fixed sediment criteria at this time. Until standards can be set, reasonable measures, as defined by the Water Pollution Control Council, must be taken to minimize sedimentation from man's activities.*

**Minimum treatment requirements set forth by the Council are:**

1. *Domestic Sewage – the minimum treatment required for domestic sewage shall be secondary treatment or its equivalent with the understanding that properly designed and operated sewage lagoons will meet this requirement.*

2. *Industrial Wastes – the minimum treatment required for industrial wastes shall be secondary treatment or its equivalent.*

**Definitions of the water use classifications assigned to the Columbia and Missouri Basins and the Hudson Bay drainage in Montana are:**

*"A–Closed" – Water supply for drinking, culinary and food processing purposes, suitable for use after simple disinfection. Public access and activities such as livestock grazing and timber harvest should be strictly controlled under conditions prescribed by the State Board of Health.*

*The Council has classified as "A–Closed" only those waters on which access is presently controlled by the utility owner. If other uses are permitted by the utility owner, these waters shall be reclassified "A–Open–D 1" or lower.*

*"A–Open–D 1" – Water supply for drinking, culinary and food processing purposes suitable for use after simple disinfection and removal of naturally present impurities. Water quality shall also be maintained suitable for the use of these waters for bathing, swimming and recreation (See "Note" below), (where these waters are used for swimming and other water contact sports, a higher degree of treatment*

Note: Common sense dictates that swimming and other water contact sports are inadvisable with a reasonable distance downstream from sewage treatment facility outfalls.

*may be required for potable water use); growth and propagation of salmonid fishes and associated aquatic life, water fowl and furbearers; agricultural and industrial water supply. Therefore, these waters shall be held suitable for "A–Open", "C", "D", "E" and "F" uses but may not necessarily be used for all such purposes.*

*Waters in this class, if shown to meet the "A–Closed" criteria, may be so classified by the Council at the request of the utility owner.*

*All waters within the boundaries of national parks and nationally designated wilderness, wild or primitive areas in Montana are classified "A–Open–$D_1$" except those adjacent to developed areas such as Snyder Creek through the community of Lake McDonald and Swiftcurrent Creek below the Many Glacier Chalet, both in Glacier National Park. Also, Georgetown, Flathead and Whitefish Lakes and Lake Mary Ronan are classified as "A–Open–$D_1$" as are some streams presently used for domestic water supply.*

*"B–$D_1$" The quality of these waters shall be maintained suitable for drinking, culinary and food processing purposes after adequate treatment equal to coagulation, sedimentation, filtration, disinfection and any additional treatment necessary to remove naturally present impurities; bathing, swimming, and recreation (see note under "A–Open–$D_1$"); growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; agricultural and industrial water supply. Therefore, "B–$D_1$" equals "B", "C", "$D_1$", "E" and "F".*

*"B–$D_2$" The quality of these waters shall be maintained suitable for the uses described for "B–$D_1$" waters except that the fisheries use shall be described as follows:*

*"Growth and marginal propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers."*

*Therefore, "B–$D_2$" equals "B", "C", "$D_2$", "E" and "F".*

*"B–$D_3$" The quality of these waters shall be maintained suitable for the uses described for "B–$D_1$" waters except that the fisheries use shall be described as follows:*

*"Growth and propagation of non–salmonid fishes and associated acquatic life, waterfowl and furbearers."*

*Therefore, "B–$D_3$" equals "B", "C", "$D_3$", "E" and "F".*

*"C–$D_2$" The quality of these waters shall be maintained suitable for bathing, swimming and recreation; growth and marginal propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; agricultural and industrial water supply. Therefore, "C–$D_2$" equals "C", "$D_2$", "E" and "F".*

*"$D_2$" The quality of these waters shall be maintained for growth and marginal propagation of salmonid fishes and associated aquatic life, water fowl and furbearers; agricultural and industrial water supply. Therefore, "$D_2$" equals "$D_2$", "E" and "F".*

*"E" The quality of these waters shall be maintained for agricultural and industrial water supply uses and "E" shall equal "E" and "F" uses.*

*"F" The quality of these waters shall be maintained suitable for industrial water supply uses, other than food processing.*

Sources: 1. "Montana Water Laws: A Resume," Inventory Series Report No. 5, Montana Water Resources Board, Helena, Montana, November, 1968

2. "Water Resources Survey," Flathead and Lincoln Counties, Montana, State Engineer's Office, Helena, Montana, June,1965

3. "Water Quality Criteria," "Water Use Classifications," "Policy Statements," communication from Claiborne W. Brinck, Director, Division of Environmental Sanitation, State Department of Health, Helena, Montana, May 7, 1968

# APPENDIX II.

## COMMUNITY WATER SYSTEM FACILITIES

### ANALYSIS CRITERIA

Complete designs of safe community water systems can become extremely complicated. Each design and analysis is usually a unique problem for that individual system. For this study, a general approach must be used; however, it is realized that a more detailed study may result in somewhat different findings and proposals. The following paragraphs contain a discussion of the approach used in arriving at general design criteria used herein.

In the analysis and design of water systems, the interrelations of supply, transmission, storage, and distribution must be considered. For example, if the water supply is not adequate to meet the peak hourly demand, storage is necessary to provide a reserve for the peak periods. The size of the various portions of the system is determined by establishing the average daily demand on the system.

The determination of daily water consumption is arrived at by considering records of existing systems. Usage varies over a wide range of about one hundred gallons per capita per day (gpcpd) to six hundred gpcpd. Usages of four hundred gpcpd are very common during hot weather. The basis of analysis used, herein, is two hundred gpcpd average. The accepted nationwide average daily demand value for a community water system is 125 gallons per day per person for domestic use. Records show that practically all Montana communities exceed this amount especially during hot weather, and the two hundred gpcpd is more in line with present day demands for communities in Montana.

Well capacities and capacities of other sources of supply must be sufficient to provide water for the average requirements and additional amounts to sustain peak periods. It is felt that a water source capable of supplying the total average daily demand by operating for a twelve hour period is a suitable basis for analysis. This means that the average daily demand doubled, divided by twenty four hours per day and sixty minutes per hour, will result in a required rate of supply in gallons per minute. It is realized that this source may be required to operate more than twelve hours during high demand periods. This freedom in operation, combined with storage facilities, is intended to provide the necessary flexibility to handle low and high demand periods economically.

It is common practice to provide storage facilities with capacity equal to the supply necessary for one average day. This will provide storage for fire protection and any excess will add to the flexibility of the system. Table B shows desired storage for fire based on population. This information corresponds to requirements of the Montana Fire Rating Bureau and is taken from "Community Water Supplies" by Ameen.

During certain times of the year water consumption will exceed the average figure of two hundred gpcpd. The system analysis must be checked to determine the amount of water actually available to supply such demands. The estimated 1990 population is used for this check so that population increases are considered. Also, it is expected that the source will have to operate for more than the twelve hour period and any storage in excess of the recommended reserve for fire will be available for domestic consumption. The recommended storage for fire is shown in Table B.

It is considered that the source must produce water for an eighteen hour period. This value, times the well yield, results in a value for the amount of water that can be put into service per day. Also included is the storage not required for fire reserve. The sum of those two values divided by the 1990 population, yields the water available in gallons per capita per day. If water demand exceeds this amount, meters or some other means of controlling water usage must be employed. The above approximate approach results in an adequate amount of water being available and is considered to be the general

analysis criteria which is applicable for all the communities studied.

**Summary of Analysis Criteria**

| | |
|---|---|
| Average Daily Water Consumption (gpcpd) | 200 |
| Desired Output of System (gpcpd) | 400 |
| Desired Yield of Source (gpm) | 1.5 to 2.0 x Average Daily Consumption / 24 Hour/Day x 60 Minute/Hour |
| Desired Storage | One Average Day's Supply |

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## TABLE B

### Desired Storage For Fire

| Population | Storage (Gals.) | Population | Storage (Gals.) |
|---|---|---|---|
| 200 | 26,800 | 2,200 | 92,800 |
| 400 | 33,400 | 2,400 | 99,400 |
| 600 | 40,000 | 2,600 | 106,000 |
| 800 | 46,600 | 2,800 | 112,600 |
| 1,000 | 53,200 | 3,000 | 119,200 |
| 1,200 | 59,800 | 3,500 | 135,800 |
| 1,400 | 66,400 | 4,000 | 152,400 |
| 1,600 | 73,000 | 4,500 | 169,000 |
| 1,800 | 79,600 | 5,000 | 185,600 |
| 2,000 | 86,200 | 5,500 | 202,200 |

Source: "Community Water Systems" by Ameen.

# APPENDIX III.

## COMMUNITY SEWER SYSTEM FACILITIES

### ANALYSIS CRITERIA

The Montana State Department of Health has adopted the "Ten State Standards" as the criteria for the design of the various elements of the sewer system. Proposals contained herein are based on the recommendations of these standards.

Wastewater stabilization ponds are considered to be the most suitable means of sewage treatment for most smaller communities. The recommended sizes are derived from the criteria of one acre per one hundred population. This criteria is adequate if normal domestic sewage is encountered for all cases; however, more detailed study and analysis is required for final design.

Sewage collection and outfall mains are to be a minimum of eight inches in diameter according to the "Ten State Standards". This minimum is established since reasonably maintenance free systems will result. In many small communities, the sewage flow does not justify this size; however, the possibility of plugging is minimized.

Capacities for the various size lines are determined for minimum grades with the pipe flowing two thirds full and are shown in Table C. Where sewage force mains are required, a minimum of four inch pipe is proposed. Larger lines are sized according to anticipated flow.

Criteria for the sewage flows used in this study are as follows:

| | |
|---|---|
| Average sewage flow | 100 gpcpd |
| Peak sewage flow (laterals) | 400 gpcpd |
| Peak sewage flow (trunk and outfall) | 250 gpcpd |
| Treatment facilities | 100 gpcpd |

The nominal determination of pond size is based on the following:

$$\frac{100 \text{ gpcpd} \times 180 \text{ day stor.} \times 7.5 \text{ gal/cu ft}}{5\text{-ft water depth} \times 43{,}560 \text{ sq ft/acre}} = \text{one acre per } 100 \text{ people}$$

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TABLE C

**Average Capacity of Lines***

| Pipe Diameter (inches) | Average Flow (gpm) | Population Equivalent (400 gpcpd flow) |
|---|---|---|
| 6 | 110 | 390 |
| 8 | 200 | 720 |
| 10 | 320 | 1,150 (250 gpcpd flow) |
| 12 | 510 | 2,920 |
| 15 | 780 | 4,480 |
| 18 | 1,080 | 6,220 |
| 24 | 1,870 | 10,800 |

* Flowing two thirds full at minimum grade